POLICY BRIEFS IN SUPPORT OF THE
HIGH-LEVEL POLITICAL FORUM 2020

ACCELERATING SDG7 ACHIEVEMENT IN THE TIME OF COVID-19

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LIST OF CONTRIBUTING ORGANIZATIONS

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- Ministry of Foreign Affairs, Norway
- ENERGIA International Network on Gender and Sustainable Energy
- Ministry of Foreign Affairs, Denmark
- The German Federal Ministry of Economic Cooperation and Development (BMZ)
- Ministry of Energy, Kenya
- Ministry of Foreign Affairs of the Netherlands
- Ministry of Foreign Affairs, Pakistan
- World Health Organization (WHO)
- Ministry of Foreign Affairs, UAE
- African Union Commission
- European Commission
- Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH
- UN Association of China
- REN 21
- Clean Cooking Alliance
- FIA Foundation
- Global Energy Interconnection Development and Cooperation Organization (GEIDCO)
- Hivos
- International Institute for Applied Systems Analysis (IIASA)
- World Food Programme (WFP)
- Moving Energy Initiative
- PowerForAll
- Practical Action
- Rocky Mountain Institute
- SEforAll
- UN Foundations
- TERI School of Advanced Studies
- International Energy Agency (IEA)
- International Renewable Energy Agency (IRENA)
- Latin American Energy Organization (OLADE)
- African Development Bank

Islamic Development Bank

United Nations Economic Commission for Africa (UNECA)

United Nations Economic Commission for Latin America and the Caribbean (UNECLAC)

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)

United Nations Economic and Social Commission for West Asia (UNESCWA)

United Nations Economic Commission for Europe (UNECE)

Food and Agriculture Organization (FAO)

International Labour Organization (ILO)

International Organization for Migration (IOM)

United Nations Development Programme (UNDP)

UN Environment

UNEP DTU Partnership

United Nations Framework Convention on Climate Change (UNFCCC)

United Nations Human Settlements Programme (UN-Habitat)

The UN High Commissioner for Refugees (UNHCR)

United Nations Children's Fund (UNICEF)

The World Bank

United Nations Industrial Development Organization (UNIDO)

United Nations Institute for Training and Research (UNITAR)

Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States (UN-OHRLLS)

Convened by:

United Nations Department of Economic and Social Affairs (UN DESA)

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PREFACE

Investing in decarbonized energy solutions with universal energy access can create jobs, make economies more competitive and steer the world towards a more resilient and sustainable future. To recover better, healthier and stronger, governments can put clean energy technologies at the heart of their post-COVID-19 economic recovery plans, with enhanced Nationally Determined Contributions as the guide.

The Covid-19 pandemic represents the biggest shock to the global energy system in decades. It has caused tremendous uncertainly in our collective efforts toward SDG 7 achievement.

Yet, we must maintain the global momentum for the clean energy transformation. Climate change remains the biggest threat to humanity over the long term. Slowing the clean energy transition will severely jeopardize our fight against climate change.

Equally importantly, without ensuring universal access to affordable, reliable and modern energy services, many SDGs will be in jeopardy since energy is strongly interlinked with the progress on poverty eradication, gender equality, food security, health, education, clean water and sanitation, jobs, innovation, transport and other objectives.

This year's High-Level Political Forum (HLPF) in July represents another opportunity to strengthen our commitment to the SDGs, including SDG 7, under the theme of *"Accelerated action and transformative pathways: realizing the decade of action and delivery for sustainable development ."* I congratulate the multi-stakeholder SDG 7 Technical Advisory Group (SDG7-TAG), convened by DESA, for successfully delivering this third edition of the Policy Briefs, in support of this year's discussions at HLPF. UN DESA will continue to support and strengthen the SDG 7 Technical Advisory Group in delivering on the 2030 Agenda and the Paris Agreement.

The UN General Assembly through resolution 74/225 invited the UN Secretary-General to convene a high-level dialogue in 2021 to promote the implementation of the energy-related goals and targets of the 2030 Agenda. As the Dialogue Secretary-General, I look forward to actively working with all Member States and other multi-stakeholders during the preparatory processes that will commence in due course.

LIU Zhenmin

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Under-Secretary-General for Economic and Social Affairs United Nations

FOREWORD

FOREWORD

We are proud to present this third compilation of SDG 7 Policy Briefs, which has been prepared to inform critically important discussions at this year's High-Level Political Forum.

With only ten years left to achieve the Sustainable Development Goals, this year marks the start of a dedicated Decade of Action to deliver on the 2030 Agenda. We must focus on the COVID-19 crisis, which is threatening to undermine the momentum of the clean energy transformation and universal energy access. We cannot let that happen. Energy access, renewable energy and energy efficiency investments need to be at the centre of the economic recovery packages, ensuring sustainability, energy security and a just and inclusive energy transition, to leave no one behind.

In order to create new jobs and business opportunities, and improve the capabilities of health care facilities throughout the world, we must double down on our efforts to mobilise investments in energy access, renewable energy systems, and energy efficiency.

Using cleaner, more efficient technologies will allow for economic growth and improved services with lower pollution levels and reduced greenhouse gas emissions.

Achieving SDG 7 will catalyse actions to reach many SDGs including poverty eradication, food security, health, education, gender equality, clean water and sanitation, jobs, sustainable cities and communities, and climate change.

We are very grateful to all the members of the Technical Advisory Group, who have presented detailed recommendations and scenarios for energy policies that can simultaneously address the SDG goals, the climate crisis and the global pandemic. Their collaborative work, involving a broad range of stakeholders, provides a model for strengthened cooperation within and beyond the UN system.

We sincerely hope that Member States and all stakeholders—including international organisations, multilateral development banks, businesses and civil society groups—will find the analysis and recommendations in the Policy Briefs useful as they review and renew their commitments to achievement of the SDGs and the Paris Agreement.

Urgent action has never been more important, and we are counting on your support to enable the achievement of SDG 7 by 2030.

Co-facilitators of the SDG 7 Technical Advisory Group:

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Executive Director, ENERGIA International Network on Gender and Sustainable Energy.

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The Division for Sustainable Development Goals (DSDG) at UNDESA provided secretariat services to the group, conceptualized the processes and products, mobilized resources, led the drafting of the Summary for Policymakers and the compilation of the policy briefs. The work was spearheaded by the sustainable energy team led by Minoru Takada and composed of David Koranyi, Bo Fu, Isabel Raya, Nadine Salame and under the overall guidance of Alexander Trepelkov, Office-In-Charge of DSDG and Shantanu Mukherjee, Chief, Integrated Policy Analysis Branch of DSDG at DESA. The Capacity Development Office at UNDESA provided overall support during the process. Special thanks are extended to Gail Karlsson who provided invaluable edits to the policy

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KEY FACTS

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1. Overall progress

Covid-19 implications for the energy sector

Urgent needs to provide electricity for health facilities: around **1 billion** people are currently relying on health facilities without electricity.

Global energy investment would fall by **20%**, or **$400 billion**, compared with 2019.

Global energy demand could fall by **6% in 2020** – seven times the decline after the 2008 global financial crisis.

Global energy-related CO2 emissions are set to fall by almost **8% in 2020**, reaching their lowest level since 2010.

Coal demand is projected to fall by **8%**.

Electrification

More than **1 billion people** have gained access to electricity **since 2010**.

789 million still remain without electricity access.

Clean Cooking

2.8 billion people still cook by burning polluting fuels.

Renewables

The share of renewables in the global energy mix reached **17.3 %** of final energy consumption in **2017**.

Efficiency

Global energy intensity has been improving at an accelerating rate of **2.2%** per year between **2010 and 2017.**

Going forward, an annual improvement of **3%** between **2017 and 2030** is required to meet the global target.

Financing

Finance - International public financial flows to developing countries in support of clean and renewable energy reached **$21.4 billion in 2017**, a two-fold increase from in **2010**.

Fossil fuel subsidies amounted to over **US$ 400 billion in 2018**, more than double the subsidies to renewables.

Climate

The world currently remains on a dangerous **3 degree** pathway.

Coal power generation is responsible for **30%** of global emissions. Hundreds more of new coal-fired power plants are still being built and are in the pipeline.

2. Regional Status

Africa

The number of people without access has been reduced from over **600 million in 2015** to about **540 million in 2019**. However, at current levels of ambition, investment and policies, about **500 million** people will still lack access to electricity in **2030**.

Access to clean cooking solutions remains a chronic challenge on the continent, with over **900 million** people still lacking access to cooking facilities.

Arab Region

The Arab region's electrification rate rose from **88.4%** percent in **2010** to **92.5%** percent in **2018**, making it the most electrified regional group of countries in the developing world.
As of **2017**, renewable energy accounted for almost **11%** percent of the Arab region's energy mix, the lowest share in any of the world's regions.

Asia

In **2018** over **200 million** people still had no access to electricity, around **5%** of the region's population, and around **1.8 billion** people, or nearly **40%** of the population, relied on polluting and unhealthy cooking fuels and technologies.

The region has demonstrated a steep decline in energy intensity, registering an annual average decline of **2.6%** from **2010 to 2017**.

LDC

In **2018**, only **52%** of the overall LDC population had access to electricity and only **16%** of the people in LDCs had access to clean fuels and technologies for cooking.

LAC

The number of people without access to electricity fell from **44 million to 12 million** between **2000 and 2017**.

The region has historically been the one with the lowest energy intensity in the world.

UNECE

Fossil fuels accounts for **80%** of the primary energy supply in the UNECE region.

Buildings consume over **70%** of the electric power generated directly and are responsible for **40%** of primary energy and **40%** of CO2 emissions by virtue of the energy services they require.

KEY MESSAGES FOR **POLICY MAKERS**

I.

These key messages were prepared to inform the review of progress on the 2030 Agenda for Sustainable Development at the High-Level Political Forum on Sustainable Development in July 2020. The overall theme of the Forum is *"Accelerated action and transformative pathways: realizing the decade of action and delivery for sustainable development."*

Overarching messages

• **We must maintain global momentum to accelerate a shift towards decarbonised, climate resilient energy systems and universal energy access.** The world has been undergoing a transformation of energy systems at an unprecedented scale, accelerated by innovations, rapid cost declines for clean technologies, and related policy shifts. New off-grid solutions and business models have been expanding electricity access, while also creating jobs, empowering women and making communities more resilient. But now we are experiencing a severe international health and economic crisis caused by the COVID-19 pandemic, which highlights the weaknesses in current energy systems. Failure to transition quickly to more accessible, affordable and sustainable energy systems will perpetuate these weaknesses, while also jeopardising the fight against climate change and threatening human well-being, ecosystems and economies for centuries. Therefore, we must maintain our highest level of political commitment, determination and unity against climate change even as we mobilise against the pandemic.

• **Although the world continues to advance toward SDG 7, overall efforts are falling well short of the scale required to reach the SDG 7 targets by 2030.** In certain countries and regions, promising progress has been made toward energy access, renewable energy and energy efficiency. These achievements amply demonstrate the potential for expediting sustainable energy progress. As countries develop polices and take actions to deal with the COVID-19 pandemic, they need to safeguard past gains in terms of more sustainable energy systems, and aim for even greater improvements to address the needs of a post-pandemic world that leaves no one behind.

• **Far more needs to be done to achieve net-zero emissions by 2050 in pursuit of the 1.5°C goal.** The world currently remains on a dangerous 3oC pathway. Current levels of ambition related to renewable energy and energy efficiency do not match the efforts needed for meeting the mitigation targets set out in the Paris Agreement. Countries should integrate more ambitious targets and policies into their enhanced NDCs.

• **Post COVID-19 recovery strategies present opportunities for economies to become greener and more resilient– based on the SDG 7 targets.** The COVID-19 crisis could either widen the existing sustainable energy access gaps or accelerate the path towards achieving SDG 7. The outcome depends on the priorities of national economic stimulus packages and global responses to support those most in need. Governments should invest in sustainable energy solutions to expand energy access, create jobs, improve health, make economies more competitive and resilient, and advance the SDGs.

• **We call on all Member States and other stakeholders to drive the global energy transformation forward by forming transformational partnerships.** In dealing with the pandemic, strong political commitments by governments and multilateral cooperation will be more crucial than ever in maintaining the momentum for SDG 7. Multi-stakeholder initiatives play a central role in accelerating action. UN entities, international organisations, and multilateral development banks, as well as businesses, civil society and other stakeholders, must step up and strengthen their efforts to support the implementation of the SDGs. The High-Level Political Forum, the UN Decade on Sustainable Energy for All, and the High-Level Dialogue on Energy in 2021 can all inspire actions in support of SDG 7. Other intergovernmental platforms should also be leveraged to enhance synergies to help achieve the goals of the 2030 Agenda and the Paris Agreement, including the Global Sustainable Transport Conference, the UN Ocean Conference, the Biodiversity Summit, the Food Systems Summit, the UN Framework Convention on Climate Change

Conference of Parties, Fifth UN Conference on the LDCs and the Assembly of the International Renewable Energy Agency.

Key messages

• **Access to electricity is advancing, although unevenly.** Since 2010 more than a billion people have gained access to electricity, with 90% of the planet's population connected by 2018. Yet 789 million people still live without electricity. Efforts must be intensified, especially in Sub-Saharan Africa which accounts for 70% of the global deficit. In response to the COVID-19 crisis, governments should adopt a suite of safeguards to protect energy consumers, and also work with donors and investors to ensure that utilities, off-grid developers and SMEs remain in the market.

• **Access to clean cooking continues to lag severely behind.** Globally, there are 2.8 billion people still without access to clean cooking solutions. In Sub-Saharan Africa, the number of those lacking access increased from 750 million in 2010 to 890 million in 2018. Major initiatives, political prioritisation and substantial investments will be needed to achieve universal access to clean cooking solutions. The COVID-19 pandemic has shown even more clearly the urgency of investing in clean cooking solutions for all, as exposure to air pollution increases the impacts of lung-related diseases.

• **Deployment of modern renewables needs to be scaled up in all end-use sectors, while ensuring a just energy transition.** The overall share of renewables in the global energy mix was 17.3% of final energy consumption in 2017, up from 16.3% in 2010. While renewable energy reached an unprecedented level in global electricity consumption over the last decade, with solar PV and wind leading the way, adoption of renewable energy in the heating and transportation sectors is lagging far behind its potential. Measures to safeguard and promote the renewable energy industry, and to quickly extend access to renewable energy technologies in underserved areas, including through public finance, will be critical in the wake of the COVID-19 crisis.

• **Energy efficiency ambitions need to be set substantially higher. Progress on energy efficiency is accelerating, but still remains below the target.** Primary energy intensity improved at 2.2% per year on average between 2010 and 2017, far better than the progress observed for the period 1990-2010, when annual improvements averaged 1.3%. However, achieving the global energy efficiency target will require even more dramatic improvements, at a rate of 3% per year on average between 2017 and 2030. By making energy-efficiency measures a policy and investment priority (for example, through minimum energy-efficiency standards, financial incentives, market-based mechanisms, capacity-building initiatives, and regulatory instruments), governments can help the world achieve the global energy efficiency target by 2030.

• **Investments in sustainable energy solutions are needed to protect SDG gains during the COVID-19 pandemic.** The overall financing for SDG 7 will need to more than double globally, to US$ 1.3 to 1.4 trillion per year. The bulk of investment will need to come from the private sector, but appropriate governance, institutional and regulatory structures are key to attract the capital required. Urgent action will be required to expand electricity access, including through off-grid renewables, for health facilities to address COVID-19 emergencies and provide uninterrupted cooling chains. Rapid, large-scale efforts are required since around 1 billion people are currently relying on health facilities without electricity. Clean cooking solutions are equally essential to reduce high levels of household air pollution, which increase the risks from COVID-19 respiratory illnesses, especially among women and children. Access to energy is also needed to support adequate access to information through the internet and mobile phones, and at schools that currently lack electricity. Governments have a unique opportunity to integrate sustainable energy access in their recovery plans to address fundamental threats to the SDGs while building stronger and more resilient communities and businesses.

• **As financing for SDG 7 remains uneven, special attention is needed for Least Developed Countries, Landlocked Developing Countries and Small Island Developing States.** International public financial flows to developing countries in support of clean and renewable energy reached US$ 21.4 billion in 2017, a two-fold increase from 2010. Yet, only a small proportion of this funding reached the countries most in need, such as Least Developed Coun-

tries, Landlocked Developing Countries and Small Island Developing States. Investments in off-grid solutions and mini-grids, which are especially needed to serve rural communities, remain a small proportion (1.2%) of the total financing for electricity. Financing for clean cooking is even more worrisome, with only US$ 32 million available out of the US$ 4.4 billion estimated to be needed in order to achieve universal access to clean cooking. Innovative multi-stakeholder partnerships will be essential for the energy transition in these three groups of countries in order to leave no one behind.

• **The current low fossil fuel prices offer a unique opportunity to phase out inefficient fossil fuel subsidies.** The COVID-19 pandemic has contributed to historically low oil, gas and coal prices, which will likely to persist throughout 2020. This creates an opportunity for reform, including the reduction or removal of inefficient fossil fuel subsidies while protecting vulnerable populations.

• **Adopt just transition strategies to support the phase-out of coal through clean energy plans and targets.** Coal-fired electricity generation is responsible for about 30% of global CO2 emissions. Coal power generation increased 3% in 2018, and for the first time crossed the 10,000 Terawatt/hour mark. Hundreds of new coal-fired power plants are still being built, and hundreds more are in the pipeline, with growth mainly concentrated in Asia. Cheaper renewables and weaker demand growth are also increasingly causing a large number of gas and coal-fired power stations to stand idle, with the global coal fleet running at just above 50% of capacity in recent years. In many places, coal is no longer the cheapest source of new generation. There is an urgent need to adopt practical initiatives to support the phase-out of coal through clean energy plans and targets. It will be crucial that the clean energy transition to phase-out coal be supported by concrete just transition strategies to diversify economic activities in affected communities and industries.

• **Ending energy poverty in Least Developed Countries will require a radical change of pace, and massive investment in the next few years.** Only 52% of the people in LDCs have access to electricity, and rural access rates are well below 10% in some countries. Only 16% have access to clean cooking. Without urgent and enhanced action, the 47 LDCs will not be able to reach the SDG 7 targets by 2030. Despite the extraordinary growth potential for the energy sector in LDCs, these countries rarely benefit from larger financing schemes to the same extent as more prosperous, developing countries. Non-renewable energy capacity is growing faster than renewables, and increased efforts are needed for LDCs to seize opportunities to leapfrog straight to renewable technologies. Sustainable energy should therefore be a priority thematic topic of a new 10-year programme of action for the LDCs to be adopted at the Fifth UN Conference on the LDCs in 2021.

• **Integrate gender equality and women's empowerment into all energy actions to advance the SDGs.** Empower women in the design, production and distribution of modern energy services, by developing their technical and business skills and establishing financing schemes to support gender-specific programmes and women's access to capital. It will be critical to integrate gender equality and women's empowerment measures into energy interventions taken in response to the COVID-19 crisis, including through monitoring and sex-disaggregated data collection. Post-COVID-19 economic recovery plans should be designed to empower women and advance equal representation of women in decision-making bodies in energy institutions and gender-specific programmes to promote economic empowerment of women.

• **We need to harness affordable, reliable, sustainable and modern energy solutions to scale up efforts aimed at ending hunger, strengthening global food security, reducing inequalities and ensuring a just and inclusive energy transition that leaves no one behind.** Cities must be at the forefront of this effort, by reimagining urban spaces and mobility. Proper planning of energy and water infrastructure to incorporate substantial shares of renewable energy, and improved transport efficiency, will be critical for building sustainable, resilient, and equitable cities, as well as for managing the impacts of climate change. Water systems using renewables could be less water intensive, while also improving water access, affordability and safety.

• **Current costly energy practices in humanitarian assistance will need to be changed to deliver sustainable energy solutions to those in the direst circumstances.** Renewable energy solutions can offer

substantial improvements in providing energy access to meet the needs of refugees and displaced people. However, planning and logistics are challenging in crisis situations. To reduce costs and improve services, the focus should be on increasing data availability and harnessing better data, operationalising innovative finance, and establishing a coordinated project pipeline to drive change.

• **Strengthening regional cooperation can more effectively address different regions' unique challenges.** The COVID-19 crisis shed light on the multifaceted vulnerabilities of regional energy systems in terms of sustainability and support for socioeconomic growth and development. Deliberate efforts are required to integrate sustainable energy into pandemic recovery programmes in order to protect decades of gains in energy access, renewable energy and energy efficiency, including through regional energy cooperation. Removing inefficient subsidies for fossil fuels, building support for renewables and energy efficiency, and expanding off-grid renewables for vulnerable communities offer new opportunities for accelerating shifts towards low carbon, resilient growth. Building a globally interconnected energy system could also accelerate energy sector decarbonisation, as it can help optimise the use of regionally generated resources, integrate more variable renewable energy into the grid, and improve social equity through improved reliability and affordability of energy.

• **Innovative tracking instruments, such as the Multi-Tier Framework for Energy Access, can enhance decision-making by highlighting the multidimensional nature of energy access.** The Multi-Tier Framework (MTF) reveals information on the status of energy access in enterprises, and health and education facilities, along with the vast range of technologies in use, while facilitating research on gender inequality and other outcomes. In the context of the COVID-19 pandemic, a comprehensive assessment of the status of electricity access in health facilities is critical for providing necessary support.

• **Long-term energy scenarios provide crucial guidance on energy transition pathways.** These projections analyse the socioeconomic and environmental benefits of sustainable energy policies and investments. They can play a central role in informing short-term COVID-19 crisis responses, designing mid-term green recovery policies, and promoting long-term resilience, energy security, justice, job creation, and sustainability in the energy sector. Strengthening the capacity within governments to develop and understand energy scenarios aligned with the Paris Agreement is essential for better decision making.

ADVANCING SDG 7 IMPLEMENTATION IN SUPPORT OF THE **2030 AGENDA**

II.

POLICY BRIEF

ADVANCING IMPLEMENTATION OF SDG 7 IN SUPPORT OF THE 2030 AGENDA

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International Energy Agency, International Renewable Energy Agency, United Nations Statistics Division, World Bank, and World Health Organization

KEY MESSAGES

The 2020 edition of Tracking SDG 7: The Energy Progress Report finds that while the world is moving forward toward SDG 7, efforts remain well below the scale required to realise the goal by 2030. The crisis set off by the covid-19 pandemic could either widen the sustainable energy access gaps or accelerate the path towards achieving SDG 7 – this will to a large extent depend on priorities of national economic stimulus packages and the global response to support those most in need.

Access to electricity

Since 2010, more than a billion people have gained access to electricity. As a result, 90% of the planet's population was connected in 2018. Yet 789 million people still live without electricity and despite accelerated progress in recent years, the SDG target of universal access by 2030 appears unlikely to be met, especially if the covid-19 pandemic seriously disrupts electrification efforts. Regional disparities persist. Latin America and the Caribbean, Eastern Asian and South-eastern Asia are approaching universal access but Sub-Saharan Africa lags, accounting for 70% of the global deficit.

Access to clean cooking technologies

In 2010, 56% of the global population enjoyed access to clean cooking solutions; by 2018, that share had risen to 63%. Yet over the past two decades, population growth has outpaced growth in access, leaving 2.8 billion people without access. Regional improvements show what is possible. In Eastern Asia and South-eastern Asia, the number without access fell from 1 billion to 0.8 billion; in Central Asia and Southern Asia, from 1.11 billion to 1 billion. But in Sub-Saharan Africa, slow growth in access combined with fast population growth have raised the number of those lacking access (from 750 million to 890 million). The covid 19 pandemic is likely to swell the toll of prolonged exposure of women and children to household air pollution caused by the traditional uses of biomass for cooking.

Renewable energy

The share of renewables in the global energy mix reached 17.3% of final energy consumption in 2017, up from 17.2% in 2016 and 16.3% in 2010. Renewables consumption is growing faster than global energy consumption (+2.5% vs. +1.8% in 2017), extending a trend in evidence since 2011. Most growth has occurred in the electricity sector, thanks to the rapid expansion of wind and solar power prompted by sustained policy support and falling costs. Meanwhile, progress in heating and transport is lagging. An acceleration of renewables in all sectors will be needed to achieve SDG target 7.2.

Energy efficiency

Primary energy intensity (total primary energy supply per unit of gross domestic product), improved by 1.7% in 2017, bringing the annual gain for 2010–17 to 2.2%—far better than the progress observed for 1990–2010, when annual improvements averaged 1.3% but still below the original target rate of 2.6%. Achieving SDG target 7.3 for energy efficiency will require a rate of improvement in primary energy intensity of at least 3% per year between 2017 and 2030—a challenging proposition. Preliminary estimates suggest that the improvement rate in 2018 and 2019 continues to be lower than the required rate, thus requiring even stronger improvements to reach the goal.

International financial flows to developing countries in support of renewable energy

The promising increase in flows has been concentrated in a limited number of countries, with only a small proportion reaching the least-developed countries. Total flows reached $21.4 billion in 2017, double the level of 2010. To scale up renewables in a post-covid-19 world, enhanced cooperation and far more support to the countries most in need will be essential to achieve the SDG 7 target by 2030.

TRACKING AND ANALYSING PROGRESS TOWARD

Tracking SDG 7: The Energy Progress Report, jointly produced by the SDG 7 custodian agencies[1], provides an annual tracking and analysis of recent progress toward each of the SDG 7 targets:

- SDG 7.1 | energy access (7.1.1 on electrification and 7.1.2 on clean cooking technologies and fuels),
- SDG 7.2 | renewable energy,
- SDG 7.3 | energy efficiency,
- SDG 7.A | promoting access to technology and investments in clean energy (7.A.1 on international public financial flows to developing countries in support of clean and renewable energy).

Using the latest available data for each indicator and a variety of energy scenarios, the report finds that although the world continues to advance toward SDG 7, efforts remain well below those required to reach the goal by 2030. As a cautionary note, the data and analysis of SDG 7 targets in this brief must be seen in light of the covid-19 pandemic. With its wide-ranging impact on societies and on the economy at both global and local levels including the fall in oil prices, the disruption of global supply chains and the limited ability of households and small businesses in many sectors to pay for electricity services, the pandemic is certain to affect the energy transition and progress toward SDG 7.

SDG 7.1.1 | Access to electricity

Recent progress

The share of the global population with access to electricity increased from 83% in 2010 to 90% in 2018, meaning that a billion people gained access during the period. The remaining population still without access was 789 million in 2018, down from 1.2 billion in 2010. The world has witnessed a slight acceleration in the global advance of electrification, from an average of 0.77 percentage points annually between 2010 and 2016 to 0.82 percentage points between 2016 and 2018. The world's access deficit is concentrated in Sub-Saharan Africa, where the access rate grew from 34% in 2010 to 47% in 2018. Other regions of the world are reaching access levels well above 90%. The three largest access deficits by absolute numbers are in Nigeria (85 million people), the Democratic Republic of Congo (68 million) and India (64 million).

Are we on track?

Despite the recent acceleration in electrification, the world is still falling short of what is needed to achieve the goal of universal access to electricity by 2030. Reaching the target would require an average increase in access of at least 0.87 percentage points annually through 2030. Concentrated efforts are needed to close the access gap, particularly in Sub-Saharan Africa. Policy frameworks will have to be consistently updated to capture fast-changing developments, such as innovative off-grid solutions and business models. Under current and planned policies, it is estimated that 620 million people will remain without access to electricity in 2030. As the covid-19 pandemic is likely to negatively impact the pace of energy access, further acceleration of efforts will be needed to get the world on track toward universal access.

SDG 7.1.2 | Access to clean cooking solutions

Recent progress

The share of the global population with access to clean fuels and technologies for cooking increased from 56% in 2010 to 63% in 2018, leaving approximately 2.8 billion people around the world without access. The absolute number of people without access has been largely unchanged over the last two decades, as global population growth has outpaced growth in access. Between 2010 and 2018, the population gaining access to clean cooking increased at an annualised average of just 0.8 percentage points,

1 The custodian agencies are the International Energy Agency, the International Renewable Energy Agency, the United Nations Statistics Division, the World Bank, and the World Health Organization.

and has been slowing since 2012, reaching 0.7 percentage points in 2017 and 2018. Promising improvements were made in Eastern Asian and South-eastern Asia, and in Central Asia and Southern Asia, but Sub-Saharan Africa moved in the opposite direction. The least-developed countries and countries in Africa make up 19 of the 20 countries with the largest populations lacking access; together they accounted for 82% of the global population without access in the years between 2014 and 2018.[2]

Are we on track?

To achieve the goal of universal access to clean fuels and technologies for cooking, it is estimated that access will have to grow by at least 3 percentage points annually until 2030. However, under current and planned policies, the growth rate will be far slower. The 2.3 billion people thus left without access in 2030 will continue to rely on traditional uses of biomass, kerosene or coal as their primary cooking fuel. Designing and implementing successful national and subnational strategies to promote cleaner and safer household energy requires a detailed understanding of the current state of energy use and increased efforts to promote both transitional and longer-term solutions for clean cooking.

SDG 7.2 | Renewable energy

Recent progress

The share of renewable energy in total final energy consumption (TFEC) reached 17.3% in 2017, up from 17.2% in 2016 and 16.3% in 2010.[3] This indicates that global use of renewables has grown faster than overall global energy consumption, extending a trend seen since 2011. The growth of renewables is driven primarily by increased consumption of modern renewables—that is, renewables other than traditional uses of biomass. Modern renewables commanded a 10.5% share of TFEC in 2017, up from 10.3% in 2016 and 8.6% in 2010. The largest increase in the use of renewables has come in the power sector, where their share reached 24.7% in 2017. The share of renewables was 23.5% in total final heat consumption and just 3.3% in the transport sector. Important regional differences are evident. Latin America and the Caribbean have the largest share of modern renewables of all regions, thanks to the extensive use of modern bioenergy in addition to hydropower for generation of electricity.

Are we on track?

Under current and planned policies, the share of renewables in the energy consumed will remain well below what more-ambitious energy scenarios indicate as possible. With the right policy measures focusing both on increased deployment of renewables and electrification of end-use sectors such as heat and transport, the IEA's Sustainable Development Scenario shows that modern renewables could reach a share of 23% in 2030, while fuelling 50% of electricity generation. IRENA's Transforming Energy Scenario for 2030 lays out a path toward even higher shares of modern renewables: 28% overall and 57% of electricity generation.

SDG 7.3 | Energy efficiency

Recent progress

Rates of improvement in global primary energy intensity (total primary energy supply per unit of gross domestic product) have fallen in the past few years, following a period of relative stability. Global primary energy intensity in 2017 was $5.01/MJ, equivalent to a 1.7% rate of improvement since 2016, the lowest rate since 2010. Nevertheless, recent progress has been more sustained than historical trends thanks to a range of energy efficiency policies adopted around the world. The average annual rate of improvement in global primary energy intensity between 2010 and 2017 was 2.2%, more than the historical rate of 1.3% between 1990 and 2010. Performance continued to be highest in Asia, where most parts of the region recorded rates of improvement higher than those of 1990–2010. In particular with a 3.3% annual rate of improvement, Eastern and South-eastern Asia were

2 The top 20 access-deficit countries are the 20 countries with the highest access-deficit population. These are Afghanistan, Bangladesh, China, Democratic People's Republic of Korea, Democratic Republic of Congo, Ethiopia, Ghana, India, Indonesia, Kenya, Madagascar, Mozambique, Myanmar, Nigeria, Pakistan, Philippines, Sudan, Uganda, United Republic of Tanzania and Viet Nam.

3 The share of renewables in total final energy consumption was previously stated as 17.5% in 2016. This has been amended to 17.2% in this report. Data revisions by countries in 2020 reflected a fall in solid biomass and charcoal consumption between 2000 to 2016, resulting in a decline in the share of renewables globally in the historical time series.

well above the global average. The lowest rates of improvement were found in Latin America and the Caribbean, and in Western Asia and Northern Africa, which grew by around 1% on average.

Are we on track?

With the recent slowdown in energy intensity improvement rates, the world is moving away from the target of doubling the rate of improvement in energy efficiency by 2030. To reach the target, the annual rate of improvement through 2030 must now be more than 3% from 2017 to 2030. Although economy-wide energy intensity improved faster in 2010–17 than in 1990–2010, the dynamic is different by sector. According to different intensity metrics, the rate of improvement declined compared with the period 1990–2010 in all sectors except for transport, where fuel efficiency standards drove energy intensity improvements. Increased efforts are needed across all sectors to reach the target by 2030. With the right policies in place, IEA's Sustainable Development Scenario projects that an annual average energy intensity improvement rate of 3.6% between 2017 and 2030 is possible, if energy efficiency potentials are maximised.

SDG 7.A.1 | International public financial flows to developing countries in support of renewable energy

Recent progress

International public financial flows to developing countries in support of clean and renewable energy reached $21.4 billion in 2017, 13% more than in 2016, and a two-fold increase from flows committed in 2010. Between 2000 and 2017, developing countries have received an accumulated USD 138.9 billion (2017 PPP) in support of renewables with USD 64.5 billion of these going to hydropower projects, 27.8 billion to solar, 10.1 billion to wind, 36.5 billion to other energy sources. Although this global increase in public financial flows to renewables is promising, it masks some important disparities, starting with the fact that only 20% of these financial flows reached the least-develeloped countries between 2000 and 2017. This share was down at 12% in 2017.

Are we on track?

SDG 7.A envisions enhanced international cooperation to facilitate access to clean energy research and technology, including the enabling of investment in renewables. In light of the covid-19 pandemic and tremendous variations in the ability of countries to respond to this crisis, enhanced cooperation and support to those most in need is more important than ever if the SDG 7 target is to be achieved by 2030.

ACCELERATING THE IMPLEMENTATION OF SDG 7: RECOMMENDATIONS

The 2020 edition of Tracking SDG 7: The Energy Progress Report clearly shows that even in the absence of the covid-19 pandemic, significantly accelerated efforts would be needed across all the SDG 7 targets to have a chance of achieving the goal in the coming decade. Yet promising progress toward the targets for energy access, renewable energy and energy efficiency has been made in some regions, demonstrating the potential for rapid improvements in other parts of the world as well.

In response to the covid-19 pandemic, countries around the world will have to take exceptional measures to bring the health emergency under control, limit its human toll, and avoid deep recession. Under such circumstances, countries have an opportunity to consider options for economic stimulus that not only respond to the immediate crisis, but also ensure longer-term societal, economic and environmental sustainability – with SDG 7 being at the heart of these objectives.

Pre-covid-19 estimates drawn from IEA and IRENA's scenarios estimate that achieving SDG 7 would require annual investments by 2030 of around $680 billion to renewable energy (IRENA and IEA scenarios), around $45 billion to energy access and $625 billion to energy efficiency (IEA scenario) - with a redirection of investment from fossil fuels to renewables needed to put the world on track to a sustainable future. While the bulk of these investments in the energy transition will have to come from private sources, public finance will play a significant role in spurring investment.

In this context it is important to note that financial mobilisation to underpin the achievement of SDG 7 cannot be limited to increased investments in the deployment of sustainable energy capacity and technical infrastructure. Such mobilisation must also encompass funding to support a fair transition at a broad societal level - ensuring that all individuals and communities have access to affordable, reliable, sustainable and modern energy and can equally benefit from the socio-economic impacts that will be associated with the achievement of SDG 7. A comprehensive policy package is necessary to ensure such mobilisation of funding and investments.

Further insights on necessary measures to accelerate the implementation of SDG 7 targets are highlighted below.

Access to electricity

The anticipated failure to reach the target reflects the complexities of providing access to the remaining unelectrified population, which is increasingly rural, remote, poor and living in regions affected by fragility, conflict and violence. Additionally, the disruptive effects of the covid-19 pandemic also complicate the delivery of affordable and reliable service at scale. Most countries that have made sustained progress in electrification have built national strategies around strong stakeholder buy-in, based on an integrated, calibrated approach to developing the main grid, mini-grids and off-grid technologies. Along with improving and enforcing the regulatory frameworks needed to support electrification, policies should take into account the latest innovations such as in digital development and embrace the principle of financial inclusion. Encouraging the rapid development of energy markets and leveraging private sector resources will be essential in driving down the cost of electrification and delivering services that meet consumers' needs. To ensure that gender is appropriately integrated into electrification projects, specific actions need to be taken throughout the project cycle, including an initial assessment, a plan of action for interventions and a focus on monitoring and evaluation to track progress. Finally, well targeted demand-side interventions – especially on productive uses of electricity - can unlock the potential of electrification and maximize social and economic development impacts.

Access to clean cooking solutions

Major initiatives and substantial investments will be needed to encourage the uptake of clean cooking fuels and technologies in the ten years to 2030. In particular, urgent action is needed in Sub-Saharan Africa, where population growth has outpaced growth in access to clean cooking. Breaking from the prevailing stagnation in the region will depend on initiatives to promote and enhance the infrastructure and distribution networks for scalable clean fuels like liquified petroleum gas, as well biogas and electric stoves. The latter are most likely to be effective in the presence of parallel actions to develop mini-grids and expand the use of solar panels. Policies should also focus on strengthening women's status as stakeholders, as they stand to benefit the most from clean cooking. Positioning women as leaders of clean-cooking efforts can help spread the adoption of new technologies while simultaneously promoting gender equality.

Renewable energy

Meeting the ambitious SDG 7.2 target by 2030 will require increased policy attention to the deployment of modern renewables in all end-use sectors as well as accelerated efforts to ensure a just energy transition. To substantially increase the share of renewable energy consumption, most long-term energy-transition scenarios point in the same direction: increased electrification of end uses, combined with a decarbonised power sector. Policies and measures to support the deployment of renewable energy are increasingly being adopted around the world. In particular, the use of auctions to set electricity tariffs competitively has gained popularity since 2014, owing chiefly to the ability of well-designed auctions to procure renewables-based electricity at the lowest price while also fulfilling other social and economic

aims pursued by countries.

Energy efficiency

To boost progress toward SDG target 7.3, governments will need to set their energy efficiency ambitions substantially higher. Fortunately, a range of proven policy options is available to spur efficiency gains and build a foundation for more effective action. Among successful policies to encourage greater investment in efficiency are standards for minimum energy performance, financial incentives, obligation programmes and market-based mechanisms. Harnessing emerging digital technologies to tap into innovative, system-wide increases in energy efficiency will require comprehensive and collaborative policy efforts in the energy sector and beyond.

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Latest available data put forth in the 2020 edition of Tracking SDG 7: The Energy Progress Report, finds that although the world continues to advance toward SDG 7, its efforts fall well short of the scale required to reach the goal by 2030. Access to modern energy services is at the heart of the sustainable development agenda, with potential to advance progress towards a wide range of the SDGs. SDG 7 Custodians (IEA, IRENA, UNSD, WB, WHO) therefore urge governments to ensure that past gains towards SDG 7 are safeguarded and not to lose sight of the need to continue supporting the progress of affordable, reliable, sustainable and modern energy for all – as even larger efforts will be needed to meet SDG 7 targets in a post covid-19 world.

REFERENCES

Any references to findings in this Policy Brief should be cited as follows: IEA, IRENA, UNSD, WB, WHO (2020), *Tracking SDG 7: The Energy Progress Report 2020*, Washington DC.

What is the Tracking SDG 7: The Energy Progress Report?

This policy brief is a summary of ***Tracking SDG 7: The Enery Progress Report 2020***. The report is an annual joint effort of the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA), the United Nations Statistics Division (UNSD), the World Bank (WB), and the World Health Organization (WHO), all appointed by the United Nations as global custodian agencies responsible for collecting and reporting data related to the energy targets of SDG 7.

ADVANCING SDG 7 IN THE TIME OF THE **COVID-19 CRISIS**

III.

POLICY BRIEF

ADVANCING SDG 7 IN THE TIME OF THE COVID-19 CRISIS

Contributing organisations:

UN Department of Economic and Social Affairs (DESA), UN Economic and Social Commission for Asia and the Pacific (ESCAP), UN Economic and Social Commission for West Asia (ESCWA), UN Industrial Development Organisation (UNIDO), the International Institute for Applied Systems Analysis (IIASA), HIVOS/ENERGIA, the Ministry of Foreign Affairs of the Netherlands, the Ministry of Foreign Affairs of Norway, the European Commission, and the African Development Bank.

KEY MESSAGES

Sustainable energy should play a central role in countries' efforts to recover from the COVID-19 crisis in ways that make them better and stronger.

Energy services are essential for fighting the pandemic – including for powering healthcare facilities and keeping medicines cold, supplying clean water for people to wash their hands, and providing communications services to connect people, share information, and facilitate education during social distancing. Expanding these services through increased investments in sustainable energy solutions will aid countries in responding to the pandemic while also creating significant green jobs, empowering women, reducing greenhouse gas emissions and advancing other Sustainable Development Goals. The 2030 Agenda and the Paris Agreement should be used as a road map towards more resilient societies with stronger health systems, fewer people living in extreme poverty, more gender equality, and a healthier natural environment.

The COVID-19 crisis will likely have serious effects on SDG 7 progress. 2020 is set to see the largest decline in energy investment on record, a reduction of 20% – or almost US$ 400 billion – in capital spending compared with 2019. The pandemic could either widen the existing sustainable energy access gaps or accelerate the path towards achieving SDG 7, depending on the priorities of national recovery efforts.

A business-as-usual recovery based on the systems of the past would be an enormous missed opportunity. The COVID-19 pandemic could become a disruptive triggering event that results in fundamental change towards a more sustainable energy future – if countries embrace the weak demand for fossil fuels and other positive lessons from the pandemic as an opportunity to dramatically expand sustainable energy solutions. Such action will allow them to build back better and stronger, while also advancing the SDGs and putting the world on a 1.5 °C pathway. In order to reach that outcome, governments should consider the following interrelated actions:

- Integrate sustainable energy solutions into COVID-19 responses and recovery strategies to help economies become greener and more resilient – based on the SDG 7 targets
- Use enhanced Nationally Determined Contributions (NDCs) as a framework for green investment through economic recovery packages
- Prioritise modern energy services that save lives
- Invest in renewables and energy efficiency to create green jobs
- Phase out inefficient fossil fuel subsidies
- Adopt just transition strategies to support the phase-out of coal through clean energy plans and targets
- Support vulnerable groups to leave no one behind
- Promote a more gender-equal response and recovery
- Encourage a transition from energy intensive lifestyles to more sustainable patterns
- Design development activities to prioritise green investment
- Strengthen international cooperation and multilateralism.

CONTEXT

The COVID-19 pandemic is spreading human suffering, destabilising the global economy and upending the lives of billions of people in an unprecedented way.

However, while COVID-19 is the most urgent threat facing humanity today, climate change remains as a greater threat over the long term, and we must not lose sight of that overwhelming challenge in our current responses to the pandemic. In addition, even before this pandemic, the world was not on track to achieve most of the Sustainable Development Goals. As we address the current crisis, the 2030 Agenda and Paris Agreement must remain at the centre of our efforts to recover and move forward in a better way, while also leaving no one behind.

Governments that integrate their responses to COVID-19 with their SDG targets and long-range efforts to combat climate change will create more resilient societies with stronger health systems, fewer people living in extreme poverty, more gender equality, and a healthier natural environment.

Sustainable energy has a central role to play in these efforts. Energy services are essential for fighting the pandemic – including by powering healthcare facilities, keeping medicines cold, supplying clean water for washing hands, and enabling communications services to connect and inform people and facilitate socially distanced education. Supporting and expanding these and other essential services through increased investments in sustainable energy solutions will also create jobs and grow economies, while making communities and businesses greener and more resilient, contributing to the achievement of the 2030 Agenda and the Paris Agreement (United Nations, 2019).

COVID-19 IMPLICATIONS FOR SDG 7 PROGRESS

The COVID-19 crisis will likely have serious effects on SDG 7 progress. Although the world has made important gains towards SDG 7, even before the pandemic overall progress was not on track to reach its targets by 2030. Close to 800 million people still lack access to electricity globally, while 2.8 billion people remain without clean cooking solutions. Renewables are lagging in important end-use sectors, such as transport, industry, heating and cooling, and global energy efficiency improvements need to increase significantly (IEA, IRENA, UNSD, WB, WHO, 2020).

Responses to the pandemic could either widen the existing sustainable energy access gaps or accelerate the path towards achieving SDG 7, depending on the priorities of national recovery efforts and the global response to support those most in need.

Countries need to assess the current situation and potential challenges with regard to COVID-19, SDG 7 and climate change, as outlined below.

• **Access to electricity.** The COVID-19 pandemic could seriously disrupt progress towards providing electricity for the nearly 800 million people currently without access. Low-income consumers are struggling to pay their electricity bills due to the worsening economic conditions, and many are facing potential disconnection. In addition, utilities are already under financial strain, and may struggle to provide basic services. Off-grid and mini-grid companies providing electricity in rural locations are facing particular financial hardships and could even risk insolvency (Ogunbiyi, 2020). A survey over 80 mini-grid (MG) and solar home system (SHS) companies serving more than 1.9 million customers showed that on average, these companies expect to lose between 27% (SHS) and 40% (MG) of their revenues in the coming months (SEforALL, 2020). Investor confidence and investments in energy access, including through renewable energy projects, might even decrease when national

budgets come under strain and priorities shift. Unless governments step up their efforts, progress toward electricity access may considerably slow down, especially in sub-Saharan Africa where the lack of access is most severe.

• **Clean cooking:** The COVID-19 pandemic could cause additional disease risks for women and children who are already exposed to household air pollution caused by cooking smoke. While detailed scientific data is only emerging, it appears that exposure to poor air quality is a major risk factor for mortality from the COVID-19 virus (The Guardian, 2020). Extremely slow progress on this target is leaving 2.8 billion people without access to clean cooking solutions, while the smoke from polluting cooking practices is already contributing to about 4 million of deaths annually from pneumonia and other serious diseases (IEA, IRENA, UNSD, WB, WHO, 2020, WHO, 2018). In addition, the pandemic could also have longer-term market implications for clean cooking technologies. A recent survey involving over 100 enterprises in the clean cooking sector across the world shows that two-thirds of them reported significant concerns about reduced customer ability to pay (Clean Cooking Alliance, 2020). Political prioritisation and substantial investments for clean cooking will be needed to change this situation.

• **Renewable energy:** The current pandemic can present an opportunity to accelerate a shift towards renewables. Off-grid and mini-grid renewable energy solutions provide sustainable, reliable and cost-effective services, including healthcare, water and food supply in vulnerable areas. This makes them crucial in the immediate response to COVID-19. While global energy demand is projected to drop by 6% in 2020 due to the pandemic, the growth of electricity generation from renewables appears to be holding up much better than generation from fossil fuels (for example, coal demand is expected to fall by 8% in 2020). (IEA, 2020a, IEA, IRENA, UNSD, WB, WHO, 2020). However, supply chain disruptions, construction delays and macroeconomic challenges increase uncertainty about the total amount of renewable capacity growth that will occur in 2020 and 2021. Unless strong government policies to support sustainable energy are put in place, a sustained economic recovery and low oil prices are likely to lead to a recovery in global oil demand.

• **Energy efficiency:** While the direct implications of the COVID-19 crisis on energy efficiency are yet to be fully grasped, low oil prices might make some energy efficiency measures less attractive and commercially feasible. This would quickly slow down efforts towards decarbonisation. Short-term fixes to revive economic growth might result in a decline in investments in energy efficiency, by both the private and public sectors. This would slow down progress on efficiency at a time when a rapid increase is needed. Meeting the SDG 7 target on energy efficiency requires accelerated improvement at a rate of 3% per year on average between 2017 and 2030, compared with 2.2% per year on average during the period 2010 to2017.

• **Emissions:** Due to the COVID-19 crisis, global energy-related CO2 emissions are set to fall by almost 8% in 2020, reaching their lowest level since 2010 (IEA, 2020a). This impact, however, is expected to be short-lived, especially if oil prices stay low for an extended period – unless countries make a determined effort to accelerate a shift towards renewables and energy efficiency. Coal-fired electricity generation is responsible for 30% of global CO2 emissions, and hundreds of new coal-fired power plants are still being built. The world currently remains on a dangerous 3oC pathway. To achieve net-zero emissions by 2050, far more ambitious policies and actions are required.

• **Financing and investment:** The global economic shock caused by the COVID-19 pandemic is having widespread effects on investments in the energy sector. According to the IEA (IEA, 2020b), 2020 is set to see the largest decline in energy investment on record, a reduction of 20% – or almost US$ 400 billion – in capital spending compared with 2019. Investment in renewable power projects is expected to fall by around 10% for this year, although this is much less than the expected decline in fossil fuel power investment. Spending on oil could fall by more than US$ 1 trillion in 2020, while power sector revenues could drop by US$ 180 billion. Developing countries, especially those with significant hydrocarbon industries, are expected to see a dramatic fall in revenues. Their situation is being aggravated by unprecedented outflows of capital from developing countries as a result of the COVID-19 pandemic.

INVESTING IN SUSTAINABLE ENERGY SOLUTIONS TO RECOVER BETTER AND STRONGER

A prolonged global economic slowdown due to the COVID-19 crisis will adversely impact the implementation of the 2030 Agenda and the Paris Agreement (United Nations, 2020a). The ILO estimates that the decline in working hours in the second quarter of 2020 will be equivalent to a loss of over 300 million full-time jobs globally (ILO, 2020). The most vulnerable, including women, children, the elderly, and informal workers, will be hit the hardest.

In response to the COVID-19 crisis, governments have launched an unprecedented level of economic packages, worth over US$ 9 trillion to-date, which are focused on strengthening the health and well-being of citizens, creating jobs and rebooting economies while reducing economic, infrastructure and institutional vulnerability.

However, a business-as-usual recovery based on the systems of the past would be an enormous missed opportunity. While the demand, and prices, for fossil fuels are low, there is a significant opportunity for countries to invest in sustainable energy solutions that will allow them to build back better and stronger after COVID-19, while also advancing the SDGs and putting the world on a 1.5oC pathway.

If the aftermath of the 2008 financial crisis is anything to go by, there will likely be a sharp rebound in emissions as economic conditions improve. But governments can learn from that experience and take advantage of the current crisis to invest in clean energy technologies that create jobs, make economies more competitive and build a more resilient society. Such efforts can evolve around the following interrelated actions:

• **Integrate sustainable energy solutions into post COVID-19 recovery strategies to help economies become greener and more resilient – based on the SDG 7 targets.** For policymakers, it does not have to be a choice between economic recovery and sustainable energy – it is possible to have both. For example, the Global EU response to COVID-19 and the EU recovery plan proposed by the European Commission recently presents a collective and cohesive recovery that accelerates the twin green and digital transitions with sustainable energy at its heart. Australia's Northern Territory has legislated a COVID-19 solar stimulus package. Following the Global Financial Crisis, 8% of the Republic of Korea's US$ 38 billion stimulus package and about 40% of China's US$ 586 billion package were allocated to sustainable energy investments, promoting economic revitalisation, creating new skilled jobs and putting in place clean infrastructure (Williamson and Zaman, 2020).

• **Use enhanced Nationally Determined Contributions (NDCs) as the framework for green investment through economic recovery packages.** In this context, the EU's ambition to become the first climate-neutral region by 2050 is at the heart of the European Green Deal, and reflected in the recovery response and external action. The integration of the ambitions of the EU Green Deal and the EU sustainable finance agenda tools in the economic recovery plans would create a powerful response to the both crises. International support for countries under higher levels of threat, such as Small Island Developing States, should be strengthened.

• **Prioritise modern energy services that save lives.** Around 1 billion people are currently relying on health facilities without electricity. Urgent action will be required to expand off-grid renewables for such health facilities to enable health service delivery and provide uninterrupted cold chains for medicines and vaccines. Access to clean cooking should also be prioritised to reduce smoke exposure, especially among women and children, since this is a potential major risk factor for mortality from the COVID-19. The energy needs of frontline workers and care providers, many of whom are women, should be prioritised as well. In addition, governments should prioritise sustainable energy investments that strengthen the resilience of food and agricultural systems. This includes investments in solar irrigation, mechanised processing, storage and cold chains, and enhanced logistics.

The World Food Programme has estimated that up to 300,000 people may die each day as a result of disruptions to global food supply chains due to the COVID-19 crisis (WFP, 2020).

• **Invest in renewables and energy efficiency to create green jobs.** Ambitious investments in sustainable energy can produce significant green jobs. The International Renewable Energy Agency (IRENA) estimates that transforming energy systems based on renewables could boost global GDP by US$ 98 trillion by 2050, delivering 2.4% more GDP growth than current plans and 42 million jobs globally (IRENA, 2020). The deployment of renewable energy and energy efficiency investments is labour-intensive and requires targeted capacity building initiatives. Public financial support to safeguard the renewable and energy efficiency industry will be critical in the wake of the COVID-19 crisis, since it has had disruptive effects on private finance for renewable energy deployment. To provide long-term policy certainty in this time of crisis, governments should consider affirming existing and planned support schemes, as well as continuing to implement appropriate market and policy frameworks that support a higher penetration of renewable energy and energy efficiency.

• **Phase out inefficient fossil fuel subsidies:** With the sharp drop in oil, gas and coal prices, governments have a unique opportunity to phase out inefficient subsidies on fossil fuel consumption to catalyse and speed up the adoption of clean energy, while still protecting the vulnerable. Fossil fuel subsidies to consumers amounted to over US$ 400 billion in 2018. The subsidies to oil, gas and fossil-fuelled electricity were more than double the subsidies to renewables, complicating the task of reducing global emissions (IEA, 2019).

• **Adopt just transition strategies to support the phase-out of coal through clean energy plans and targets:** Greening recovery plans provides an opportunity to pursue a coal phase-out, recognising the contributions this would make to health, resilience, and climate goals. Coal power generation increased 3% in 2018. Hundreds of new coal-fired power plants are still being built, and hundreds more are in the pipeline, with growth mainly concentrated in Asia. But due to cheaper renewables, coal is no longer the least-cost source of new generation in most markets. Current weak coal demand presents an opportunity to strengthen action towards a coal-phase out. It will be crucial, however, for this to be supported by concrete 'just transition' strategies to diversify economic activities in affected communities and industries (United Nations, 2020b).

• **Support vulnerable groups to leave no one behind:** Governments should safeguard low-income households, small and medium enterprises, and other vulnerable groups, including by suspending bill payments. Off-grid and mini-grid businesses and utilities should also be supported to help them stay in the market. In addition, energy bills can be dramatically reduced through energy efficiency measures (UNIDO, 2020). Governments should also provide electricity access for over 200 million primary school students without electricity at school (UN DESA, 2019), to ensure educational opportunities on-site or remotely. Special attention should be given to least developed countries, land-locked developing countries and small island developing states, where there is great potential for increased access through renewable energy technologies (UN OHRLLS, 2017).

• **Promote a more gender-equal response and recovery.** It will be critical to integrate gender equality and women's empowerment measures into energy interventions taken in response to the COVID-19 crisis, including through monitoring and sex-disaggregated data collection. Post-COVID-19 economic recovery plans should be designed to promote economic empowerment of women and advance equal representation of women in energy decision-making bodies. Electricity access is also critical for women to take part in the digital economy, obtain decent employment and facilitate cultural, social and political engagement. In addition, with work, education and leisure all becoming more centred in the home during the crisis, it is important to address appliance access and affordability in order to support the household 'care economy' and to reduce the burden of daily chores, especially for frontline workers, many of whom are women (ENERGIA, 2020).

• **Encourage a transition from energy intensive lifestyles to more sustainable patterns,** promoting technological and institutional changes that would result in sustainable societies. The COVID-19 pandemic could become a disruptive triggering event that results in fundamental change towards a more sustainable future for all – if people embrace its posi-

tive lessons on more efficient use of technologies for remote working, less travel and reduced air pollution and emissions and strengthen the digital economy in an inclusive and reliable manner (Srivastava, 2020).

• **Design development activities to prioritise green investment.** Multilateral and bilateral development banks should prioritise green jobs, ensuring that financial institutions and businesses reduce their dependency on fossil fuels and other raw materials. Development organisations should assist financial institutions in better appreciating and integrating sustainability risks in their activities.

• **Strengthen international cooperation and multilateralism:** International cooperation is more important than ever, to resolve both the health and climate emergencies. Like the coronavirus, greenhouse gases respect no boundaries.

These recommended actions, if packaged together, can not only influence immediate near-term responses to the COVID-19 but also generate strong synergies with on-going actions to yield tangible SDG co-benefits and reduced greenhouse gas emissions.

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IV.

ADVANCING SDG IMPLEMENTATION THROUGH NATIONALLY **DETERMINED CONTRIBUTIONS**

POLICY BRIEF

ADVANCING SDG IMPLEMENTATION THROUGH NATIONALLY DETERMINED CONTRIBUTIONS

Contributing organisations:

UN DESA, IRENA, European Commission, World Bank/ESMAP, ESCAP, IIASA, ESCWA, ENERGIA, Power for All, Kenya MoE

KEY MESSAGES

Five years after the historic signing of the Paris Agreement, countries around the world are struggling to translate their emissions-reduction pledges into concrete actions to fight climate change. The 2020 round of Nationally Determined Contributions (NDCs) offers an important opportunity to chart a future course consistent with the 1.5oC pathway by strengthening targets for energy efficiency, and for use of renewables – in the power sector plus end uses such as transportation, heating, cooling, and cooking.

Renewables coupled with energy efficiency support not only SDG 7 but also multiple other SDGs, such as poverty eradication, gender equality, climate change mitigation and adaptation, food security, health, education, sustainable cities and communities, clean water and sanitation, responsible production and consumption, jobs, innovation, transport, and the treatment of refugees and other displaced people.

Many countries recognise the centrality of sustainable energy solutions in their current NDCs. However, current levels of ambition related to renewable energy and energy efficiency do not match the levels needed for meeting the mitigation targets set out in the Paris Agreement. There are existing cost-effective options that could allow most countries to raise their renewable energy NDC pledges, while also providing investment opportunities and societal gains.

In the next round of NDCs countries should include more ambitious targets and policies to:
- increase energy access through renewable energy;

- increase access to affordable, sustainable transportation and mobility;

- reduce damage from climate-related disasters through adaptation measures;

- promote a holistic approach to clean energy deployment in order to address mitigation and resilience priorities, including those related to water, the agriculture-food chain, gender, and decent jobs;

- strengthen or add an economy-wide greenhouse gas emissions target to reflect more ambitious abatement options in the power sector;

- strengthen or add targets to support planning for renewables and grid flexibility;

- strengthen or add targets and commitments to address existing fossil fuel assets, with special regard to coal phase-out targets for the power sector, coupled with just transition plans;

- commit to not adding any new traditional coal-fired capacity;

- set air quality targets related to the energy sector; strengthen or add targets to address integration of renewables and energy efficiency with end use sectors such as heating, cooling, transportation, and cooking;

- strengthen or add targets to accelerate the development and deployment of utility-scale and behind-the-meter power storage solutions to spur the renewable energy transition.

INTRODUCTION

This policy brief discusses opportunities for advancing a clean energy transition and meeting SDG 7 targets through NDCs in support of the 2030 Agenda. Five years after the historic signing of the Paris Agreement, countries around the world are struggling to translate their emissions-reduction pledges into concrete actions to fight climate change.

While COVID-19 has currently caused a severe international health and economic crisis, failure to tackle climate change may threaten human well-being, ecosystems and economies for centuries. What is more, according to the WHO, climate change is likely to contribute to additional infectious disease occurrences.

The year 2020 represents a significant milestone in global efforts to cut energy-related carbon dioxide (CO2) emissions. It is the beginning of the Decade of Action for the SDGs and Paris Agreement. The first round of NDCs pledged under the Paris Agreement has proven inadequate to meet climate goals. Countries need to be increasingly ambitious in strengthening their targets for scaling up renewables and energy efficiency in order to cut energy-related CO2 emissions, reduce pollution, protect the environment, and chart a future course consistent with the 1.5°C pathway.

ENERGY IN NDCS

An energy development programme for renewables coupled with energy efficiency supports multiple SDGs, including those on poverty eradication, gender equality, climate change mitigation and adaptation, food security, health, education, sustainable cities and communities, clean water and sanitation, responsible production and consumption, jobs, innovation, transport, and the treatment of refugees and other displaced people.

Renewable energy

Existing renewable electricity targets, both in NDCs and other national energy policies, do not put the world on track to attain the goals of the Paris Agreement. Much more can be achieved in a cost-effective way and with considerable socioeconomic benefits.

Given the competitiveness of green energy technologies, and the multiple benefits that they bring to the economy (such as job creation and industrial deployment), renewables provide are a readily-available and cost-effective option for raising NDC ambitions.

Many countries recognise the need to scale up renewable power. 135 countries have renewable electricity targets in their national and subnational energy plans. 140 NDCs mention renewables in the power sector, but only 105 include quantified targets for renewable electricity. Current NDC renewable energy targets focus predominantly on electricity. Only 14 NDCs set targets for liquid biofuels, while 11 cover biogas outside the power sector, and 8 relate to solar water heaters.

In the power sector, current and planned national targets and policies, including the commitments made in NDCs, would deliver an estimated 5.2TW of renewables by 2030. Only 3.2TW of that would result from the implementation of existing NDC targets. In other words, governments can already increase their renewable electricity pledges by 64% in 2030, simply by aligning the next round of NDCs with other national energy plans. This is particularly true in the Middle East and North Africa (where NDC targets would more than double), Asia (+92%), and North America and Oceania (+72%) (IRENA, 2019).

Under IRENA's Energy Transformation scenario, global renewable energy installed capacity would reach over 7.7 TW by 2030, before growing further to 18.1

TW by mid-century. Under this scenario, current NDC targets (designed to reach 3.2TW) would leave 59% of the estimated renewable potential untapped. The greatest untapped potential in absolute terms exists in Asia (3 TW), then North America and Oceania (896 GW), and Europe (290 GW). The installed capacity of renewables could almost quadruple in North America and Oceania, triple in the Middle East and North Africa, and almost triple in Asia, compared to what is foreseen in NDCs.

Almost all NDCs specifically mention renewable electricity measures: in North Africa and the Middle East (100%), Sub-Saharan Africa (98%) and Asia (93%). The proportion of NDCs referring to renewables is lower in Europe (53%) and North America and Oceania (84%). So far, 19 African countries have signalled that they will increase the ambition of their NDCs in 2020, while 8 African countries have aimed to attain net zero emissions by 2050. Six countries have already confirmed that they will update their NDCs in 2020. The European Union, in the context of the European Green Deal, is already engaging more intensely with all partners to increase their collective efforts, helping them to revise and implement their NDCs and devise ambitious long-term strategies.

Renewable power targets in current NDCs do not appear to be drivers for an accelerated global energy transformation. Instead, they fail to reflect the actual pace at which renewables have grown, leaving significant room for increased targets. Opportunities for more ambitious NDC targets exist particularly in Asia, and North America and Oceania, where projected growth rates are well below recent and historical rates.

If the recent pace of growth continues, overall global renewable energy targets in NDCs could already be met by 2022, albeit with results varying by region. North America and Oceania had already achieved their current NDC targets by the end of 2018. Latin America and the Caribbean would reach their target renewable energy deployment in 2021, and Asia and Europe in 2022. All regions would achieve their current NDC targets by 2029, by which point global deployment would exceed current overall targets by 2.7 TW. Thus, the ambition expressed through NDC targets could already almost double just by reflecting the recent pace of renewable energy deployment.

Power sector decarbonisation alone will not suffice to meet Paris Agreement objectives. Rather, the entire energy sector must undergo a profound transformation through the adoption of renewables and energy efficiency measures, as well as increased electrification of end uses and a new perspective on energy demand and services.

Energy efficiency

Many countries' NDCs do not include specific energy efficiency commitments, even though it is of major importance in the energy supply sector, including production, transformation, transport and distribution. 143 countries mention energy efficiency in their NDCs; 53 refer to energy efficiency in buildings and 38 address building energy codes. However, current investments in energy efficiency do not match the requirements for meeting the mitigation targets set out in the Paris Agreement.

The right energy efficiency policies can achieve over 40% of the emissions cuts needed under the Paris Agreement. However, this requires deep changes to the socioeconomic foundations of the energy system and a shift in perspectives away from a central supply system towards a more decentralised system focusing on the needs of energy users.

The building sector is responsible for approximately half of global electricity consumption. 53 countries mention building energy efficiency in their NDCs, representing 63%of global building energy consumption. 38 of them specify building energy codes, including large countries such as China, India, Japan and the United States, as well as small and medium-sized countries like Afghanistan, Grenada, Ivory Coast, and Saudi Arabia. Among the top 10 building energy consumers globally, all save Russia and Indonesia included building energy efficiency in their NDCs.

Countries mention several different strategies in their NDCs for leveraging their building energy efficiency potential, including building energy codes for new and existing stock, appliance standards, energy efficiency resource standards, rating systems, renovation targets, and energy consumption goals. China, for example, mentions new and existing buildings in both urban and rural settings, as well as specific targets for green buildings. India mentions its building energy code and enhanced implementation.

NDCs tend to be high-level targets rather than detailed implementation plans. However, as countries flesh out their NDC implementation strategies, a growing number of them are likely to describe how they are using building energy efficiency to meet climate goals. For example, European Union members submitted a combined NDC with broad, economy-wide emission reduction targets, but individual EU members have begun issuing more detailed plans that include building energy efficiency. Australia, Canada, and several other countries have taken a similar approach.

Other final energy demand sectors of key relevance for energy efficiency include agriculture and forestry, together with transport and industry.

STRENGTHENING PLEDGES IN 2020 THROUGH HOLISTIC POLICIES

In order to simultaneously address the climate threat, decarbonise energy use and achieve multiple SDGs, the targets and actions in the NDCs to be submitted in 2020 should be designed to maximise the development and economic benefits from climate action and avoid trade-offs.

More ambitious renewable energy targets, within and beyond the power sector, would enable the new round of NDCs submitted in 2020 to drive the necessary changes outlined above. Cost-effective options exist for most countries to raise their renewable energy NDC pledges, allowing for both investment opportunities and societal gains.

Ambitious action to reduce short-lived climate pollutants (SLCPs) is particularly needed, as actions to mitigate these potent pollutants were often underrepresented in the first NDCs submitted. Although about 131 countries included SLCP in their NDC's, only 43 countries included clean cooking targets. More ambitious clean cooking targets are needed to reduce highly potent pollutants and avoid potential climatic tipping points that will adversely affect poor and vulnerable communities. As countries look toward submitting new or updated NDCs, they have an opportunity to strengthen actions to reduce SLCPs in their NDCs by setting more ambitious targets and policies for promoting clean cooking.

According to IRENA, an overall transformation of the energy system would not only bring the world closer to achieving global climate objectives but would also bring socioeconomic benefits, and be less expensive than a business-as-usual scenario. By 2050, the energy transformation could lead to additional gains in global GDP of as much as US$ 98 trillion and to an increase in energy sector employment of 14%, compared to current plans. The transformation would result in cumulative net savings of between US$ 45 trillion and US$ 140 trillion through 2050, derived from lower net energy subsidies and reduced human and environmental health damage (IRENA, 2019 and 2019b). However, different impacts (positive and negative) can be expected in different countries and regions, due to the diversity of socioeconomic structures and their interactions with the energy transformation.

To ensure a just transition, an integrated policy framework is needed that pays greater attention to the impacts of energy on society, institutions, financing, ownership structures and the wider economy.

The policy framework would encompass three sets of transformative policies: enabling, integrating and deployment policies.

Enabling policies aim to strengthen co-ordination between the energy sector and the rest of the economy. They might focus, for example, on: industrial policies for making the energy sector a leading sector of the economy; building the necessary skills and capabilities for renewables production, use and application through education and training policies; facilitating labour mobility and job security through labour market and social protection policies; and developing adequate public investment strategies through financial policies.

Integrating policies aim to promote the integration of renewables with countries' economic ambitions and social objectives; these include infrastructure policies and policies for sector coupling and storage (IRENA, 2019).

Deployment policies are specifically aimed at accelerating the uptake of renewables, including push policies such as targets and mandates, pull policies such as administratively and competitively set tariffs, and fiscal and financial incentives. .

Policies must be carefully selected and designed, taking into consideration specific national and local circumstances. As the sector matures, policies must adapt to changing market conditions in order to ensure a cost-effective and sustainable energy transformation. This requires supporting effective participation and sound co-ordination among all stakeholders (IRENA, IEA and REN21, 2018).

Advancing the global energy transformation to address climate challenge would require a massive scaling-up and re-directing of investments in the energy sector. A cumulative US$ 110 trillion would be needed under an energy transformation scenario. Of this, only 20% (or US$ 22.6 trillion) would be for new renewable generation capacity, which illustrates the fact that power is only one aspect of the solution. Over US$ 37 trillion would need to be invested in energy efficiency, US$ 13 trillion in electrification (including for electric vehicles and railways) and US$ 12 trillion in power grid and energy flexibility measures (including smart meters and energy storage).

To exploit the full cost-effective potential for renewables in the power sector, IRENA estimates that US$ 22.6 trillion in cumulative investment would be needed in renewable generation capacity by mid-century (IRENA, 2019, 2019b. This implies at least a doubling in annual investments compared to current levels, from US$ 289 billion in 2018 to US$ 662 billion through 2050 (Frankfurt School–UNEP Centre/BNEF, 2019; IRENA, 2019).

Achieving the full cost-effective potential for renewables in the power sector requires at least a doubling of current annual investments, from US$ 289 billion to US$ 662 billion. If renewables were to grow at the 8.6% annual rate experienced in 2015-2018, global renewable energy targets in NDCs would be achieved by 2022.

In closing the financing gap, the private sector will continue to provide the bulk of renewable energy investment, but public capital and support will remain important to kick-start new markets and mobilise new capital sources. The private sector currently finances around 90% of annual direct investment in renewable energy assets, on average (IRENA and CPI, 2018). This includes non-energy producing companies, which have started sourcing electricity and heat from renewables. Due to its limited availability, public capital is unlikely to increase above current levels. Public resources and support should, therefore, be used to systematically attract private capital via targeted capacity building, support for demonstration projects, blended finance initiatives and risk mitigation solutions (IRENA, 2016).

Stable, comprehensive and transparent policy frameworks are needed to stimulate private sector participation and investments by alleviating financing barriers and ensuring predictable project revenue streams. While renewable energy targets – both in the NDCs and other national energy plans – provide a critical policy signal for the private sector, dedicated policies and measures in support of these targets are required for them to be effective. These include, for example, feed-in tariffs and premiums, auctions, renewable portfolio standards and regulatory mandates (IRENA, 2016).

POLICY RECOMMENDATIONS

In the next round of NDCs, countries should:

• explicitly include targets or policies in the following areas (UNDP, 2019):

  • increased energy access through renewable energy;
  • increased access to affordable, sustainable

transportation and mobility;

- improved air quality and health outcomes;
- reduced damage from climate-related disasters through adaptation measures, such as better land-use planning or integrated coastal zone management;
- sustainable food and agriculture systems, including measures that increase food security;
- climate-appropriate green jobs and/or just transition programs and investments; and
- gender-related objectives, such as to ensure women's rights and tenure to land, water, forests, and housing.

• Promote a holistic approach to clean energy deployment to address mitigation and resilience priorities, including in water, the agriculture-food chain, gender, decent jobs, and others, and reflect those in NDCs (IRENA, 2019).

• Strengthen or add an economy-wide GHG target to reflect more ambitious abatement options in the power sector, and strengthen or add an ambitious GHG target for the power sector (e.g., a power-sector carbon-intensity target or a coal plant emissions-reduction target) (IRENA, 2019).

• Strengthen or add targets to support planning for renewables, for example (IRENA, 2019):

- Renewable energy targets as a share of total electricity generation mix;
- Renewable energy targets aligning with longer-term national plans and with national cost-effective renewable energy potential;
- Energy access targets (e.g. also through the deployment of decentralised energy solutions);
- Rooftop solar targets.

• Strengthen or add targets to support grid flexibility (IRENA, 2019):

- Energy storage targets to support renewable energy deployment;
- Targets for smart meter deployment and forecasting technologies to predict real-time output of variable renewable energy generation.

• Strengthen or add targets and commitments to address existing fossil fuel assets, for example (IRENA, 2019):

- Coal phase-out targets for the power sector, coupled with just transition plans;
- Commitments to no new added traditional coal-fired capacity;
- Air quality targets related to the energy sector.

• Strengthen or add targets to address integration of renewables energy and energy efficiency with end-use sectors such as heating, cooling, transport, and with cooking solutions as well (IRENA, 2019).

• Strengthen or add policies and actions for the power sector (IRENA, 2019).

• Accelerate the development and deployment of utility-scale and behind the meter power storage solutions to spur the renewable energy transition (IRENA, 2019).

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V.

STRENGHTENING **INTERLINKAGES**

POLICY BRIEF

STRENGTHENING INTERLINKAGES

Contributing organisations:

UN DESA, IIASA, ENERGIA, ESCWA, ESCAP, European Commission, Hivos, UNIDO, IRENA, REN21, WHO, Power for All, Kenya MoE

KEY MESSAGES

Advancing human well-being

Progress on SDG 7 is a precondition for economic development, poverty alleviation (SDG 1), reducing inequalities (SDG 10), and achieving other SDGs. It will also support the principle "leave no one behind", by helping to ensure access to affordable, reliable, sustainable and modern energy for all, while also taking into account the quality of that energy access. Making progress in achieving universal modern energy access requires significant efforts from governments, particularly in Least Developed Countries (LDCs), designed to elevate universal access to electricity and clean cooking to a priority position on the political agenda, and backing up commitments with strategic planning, clear policies and dedicated institutions.

Ending hunger and achieving food security for all

Energy access is critical for ending hunger and achieving global food security. The Water-Energy-Climate-Food (WEF) Nexus is a policy and planning approach designed to manage trade-offs and synergies in addressing simultaneous demands for huge increases in water, energy and food supplies over the next decades, while securing a climate-proof future and protecting the environment. Strengthening the capacity of countries in harnessing clean and renewable energy technologies will strengthen food security, expand sustainable food production and address other challenges related to the WEF Nexus.

Protecting the planet and building resilience

The energy sector must be engaged in global efforts to reduce emissions and mitigate climate change, thereby achieving SDG 13. Current commitments to renewable energy and energy efficiency are insufficient to achieve the 2030 Sustainable Development Agenda and the Paris Agreement. Therefore governments should implement new, radical measures to further promote integration of climate change and sustainable development goals.

Sharing economic benefits

For a just and inclusive energy transition, policy makers should address the interlinkages between energy, climate change, poverty and inequality by:

promoting productive uses of energy; enhancing gender equality and health equity, acknowledging the special vulnerability of women; addressing conditions of "fuel poverty"; and also supporting renewable energy, and energy efficiency investments by low-income households.

Bolstering local action to accelerate implementation

Cities are responsible for 70% of the global greenhouse gas emissions from burning fossil fuels, and will need to be the centres of action on decarbonising. As municipalities and regions undertake energy transitions, they must democratise the energy sector so it is responsive to a range of stakeholders, and is held accountable for provision of clean energy in an equitable and inclusive manner.

Energy lies at the heart of both the 2030 Agenda for Sustainable Development and the UN Paris Agreement on climate change. Advancement in achieving SDG 7 has the potential to spur progress across the other SDGs— on poverty eradication, gender equality, climate change mitigation and adaptation, life on earth, oceans, food security, health, education, sustainable cities and communities, clean water and sanitation, jobs, innovation, transport, and the treatment of refugees and other displaced people.

This policy brief highlights the interlinkages between energy and the themes of the other five thematic sessions to be featured at HLPF 2020. These themes are based on the first Global Sustainable Development Report (GSDR) prepared by the Independent Group of Scientists appointed by the United Nations Secretary-General.

• **Advancing human well-being:** focusing on various trade-offs and synergies related to improving human well-being, and more particularly ending poverty in all its forms and dimensions (SDGs 1, 3, 4, 6, 16, and 17).

• **Ending hunger and achieving food security for all:** strengthening the livelihoods of the poor, ensuring sustainable and healthy food production systems, and improving the lives of all (SDGs 2, 3, and 17).

• **Protecting the planet and building resilience:** pursuing policies, investments and innovations to address disaster risk reduction and protect the planet from degradation (SDGs 12, 13, 14, 15, and 17).

• **Sharing economic benefits:** tackling inequality within and among countries, decoupling growth from environmental degradation, and achieving sustainable development for future generations (SDGs 5, 7, 8, 10, and 17).

• **Bolstering local action to accelerate implementation:** promoting measures to empower and support cities, local authorities and communities, as well as sustainable urban development, infrastructure and people-centred services (SDGs 9, 11, and 17).

ADVANCING HUMAN WELL-BEING

Well-being – which includes material conditions, health, education, voice, access to a clean and safe environment, and resilience – is at the core of sustainable development. Human well-being is inherently important, and also supports people's capabilities, in turn, to drive global social, economic, climatic and environmental change, according to their knowledge, skills, competencies, and psychological and physical abilities (GSDR, 2019).

The world has made substantial advances in human well-being in recent decades, but extreme deprivations linger, and progress remains uneven. In 2018, 8.6% of the world's population lived in extreme poverty, which is defined as living below the monetary threshold of US$ 1.90 per person/per day (UN Sustainable Development Goals Report, 2019). Extreme poverty is concentrated in specific regions, with more than half the world's extremely poor living in five countries in Sub-Saharan Africa and South Asia. In 2030, fragile States affected by crisis and conflict will be home to 85% of those remaining in extreme poverty – some 342 million people (UN Sustainable Development Goals Report, 2019).

Current estimates indicate that the world is not on track, without additional effort, to eradicate extreme poverty by 2030. Extreme poverty is now concentrat-

ed among marginalised groups – including women, indigenous peoples, ethnic minorities, and persons with disabilities. Gender inequality, which limits the opportunities and capabilities of half the world's population, further exacerbates the conditions of women in poverty. In many places, persons with disabilities still experience lower levels of education, higher rates of unemployment and economic inactivity and a lack of social protection in comparison with their peers.

Making progress on SDG 7 is a critical precondition for economic development, poverty alleviation (SDG 1) and reducing inequalities (SDG 10). Progress on SDG 7 can be seen as a means towards achieving other SDGs and the principle "leave no one behind", while benefiting all by ensuring access to affordable, reliable, sustainable and modern energy. Unequal access to modern energy services and low human development are highly correlated. The concept of "energy poverty" includes "fuel poverty" in the developed world, but in the developing world it is most often used in the context of lack of access to electricity, and/ or clean cooking fuels or technologies.

About 789 million people still lack access to electricity and 37% lack access to clean cooking fuels and technologies, according to latest figures from 2018 (Tracking Report, 2020). This directly negatively impacts socio-economic development potential.

Lack of access to clean cooking disproportionately affects women and children who spend hours every day close to a smoky fire. Women in developing countries spend up to 10 hours per week collecting fuel. This impacts mainly the health of women and children, and their potential for conducting other activities, like economic activities and education. Oftentimes, clean cooking solutions are not affordable by the poorest people, and even when people can afford clean cookstoves and fuels the supply may be limited or non-existent.

Policies for promoting renewable energy and energy efficiency will greatly help in reducing air pollution and improving health, especially in urban areas. Around 91% of the world's population breathes polluted air, which kills over 7 million people every year. The major outdoor pollution sources include fossil fuels for motor vehicles, power generation, industry or building heating systems, plus agricultural activities, and waste incineration.

Affordability plays a major role in securing energy access. Particularly in off-grid settings, households may be unable to cover the initial cost of connecting to the system, even though they would be willing and able to pay for the electricity used. No country has gone from poverty to prosperity without making electricity affordable and available in bulk for productive uses.

In situations where people do have access to clean energy services, the poorest often end up paying disproportionate shares of their income for energy, in part because of the higher upfront costs for energy-efficient equipment, both on the supply and demand sides. The poorest households without access to clean cooking options often spend much of their income buying firewood or charcoal. The cost impacts of public clean energy incentive schemes may disproportionately burden poorer consumers. Where schemes are paid for by consumers rather than taxpayers, the poorest in society are likely to pay proportionately more. If taxes are progressive, paying for these schemes via taxes is likely to be less regressive than consumers paying via their bills. Subsidising energy efficiency equipment and/or bills for lower income families may be one important avenue for boosting energy efficiency.

Public money tends to favour national grid infrastructure over smaller-scale, off-grid development. However, the International Energy Agency (IEA) estimates that 70% of Sub-Saharan Africa will be electrified through distributed renewable energy solutions.

Private sector financing and strategic involvement is necessary to complement public sector finance in realising universal energy access in conjunction with renewable energy uptake. This is often prevented by high financing costs as a result of a range of technical, regulatory, financial and informational barriers and their associated investment risks. Public-private partnerships may be able to make private-sector energy solutions affordable and efficient for low-income households.

In addition, given the potential of energy access to support advancement in other sectors, it will be necessary to expand the financing pool to include funds allocated for other development activities that have an energy access component. At the national level, this would involve sectoral ministries related to education, health care, rural development, youth and

women, and livelihood promotion. At the international level, this would include development aid organisations' and DFI commitments to nexus sectors (HIVOS, 2019).

Policy priorities for advancing human well-being

• *Set policy targets that take into account the quality of energy access.* The Multi-tier Matrix for Measuring Access to Household Electricity Supply outlines six different levels of energy access from 0 to 5. It is only at Tier 3 and above that there are new opportunities for productive uses that lead to poverty reduction. Policy targets formulated for energy access should transcend a binary approach (access or not) and institute timelines and milestones for percentages of population that can graduate to Tier 5 (full) access to energy. They should also acknowledge "fuel poverty" and support energy efficiency investments by low-income households.

• *Elevate universal access to electricity and clean cooking to a priority position on the political agenda*, particularly in LDCs. Commitments should be backed up with strategic planning, clear policies and dedicated institutions. This includes energy development scenarios, such as charting the expansion of power grids and the integration of decentralised solutions into rural electrification strategies, combining Tier 5 ("full") energy access with the promotion of productive energy use, and supporting energy efficiency investments by low-income households and off-grid electricity providers. Identifying priority areas, such as extending electricity access to schools, health centres and productive sectors, could help maximise social impacts even with limited funds. Similar approaches need to be taken for non-electrified clean cooking options.

• *Promote private sector financing to contribute to clean energy access.* Policymakers should analyse the investment risks contributing to high financing costs and address those risks in a systemic and integrated manner. Policy de-risking instruments geared towards renewable energy uptake should be prioritised, as these offer the most cost-effective sustainable future solutions. Market transformation will usually require combining these with financial de-risking instruments, supplemented by direct financial incentives as required, covering supply and demand-side requirements, ranging from revolving funds, aggregation to subsidies and results based financing. Removing fossil fuel subsidies also will be helpful.

• *Enable the use of nexus finance for energy access,* which involves coordination among various ministries and developmental agencies that have interlinkages with energy access. Mechanisms should be identified to ensure funds are allocated for the remote and low-income households. It would also be worth investing in coordination at the subnational level through local governments.

ENDING HUNGER AND ACHIEVING FOOD SECURITY FOR ALL

Food production is energy-intensive. Around 30% of global energy consumption is related to producing, harvesting, processing, storing, transporting, and distributing food. However, the global food system, which employs over 1 billion people, is unsustainable because of its negative climate and environmental impacts, and its shortcomings in providing healthy, safe nutrition for all (GSDR, 2019). It is estimated that more than 820 million people are hungry, and this number is likely to increase due to population growth. Food production is also highly vulnerable to climate change, which has impacts that increase famines and food insecurity.

Lack of access to modern energy and technology contributes to food insecurity, as well as waste in the food chain. More energy efficient technologies and reliable energy supplies are needed in the agricultural sector to improve food security and help rural farming communities move out of persistent poverty. Deployment of renewable energy technologies is

particularly critical for expanding modern energy access in rural areas, and also limiting greenhouse gas emissions related to global agriculture.

Boosting renewable energy applications for food production, and use of agricultural waste for energy generation, can be accomplished through technological advances and innovations in the mode of delivery of these technologies (IRENA, 2019). Improvements in end-use appliances have already unlocked several new applications for off-grid renewable energy technologies, including agricultural processing equipment, water pumps and milking machines (IRENA, 2019).

Biodigesters using agricultural residues and livestock waste are already being used to produce cooking fuels and electricity (IRENA, 2019c; IRENA, 2016). In addition, geothermal energy can be used to provide heat for use in the agriculture-food sector,for instance in greenhouses or for food drying and processing (IRENA, 2019).

Renewable energy is a major element in the Water-Energy-Climate-Food (WEF) Nexus, which is a policy and planning approach designed to manage trade-offs and synergies in addressing simultaneous demands for huge increases in water, energy and food supplies over the next decades, while securing a climate-proof future and protecting the environment. Renewable energy can help to decarbonise the food production industry, and bolster food security. An energy system with substantial shares of renewable energy could be less water-intensive, and also boost water security by improving accessibility, affordability and safety.

Key advantages of the Nexus approach are that it reduces costs and risks and attracts increased investments and financial support. It also offers opportunities for stakeholder dialogue and public awareness-raising.

Renewable energy technologies can be applied in many aspects of the transition to clean cooking technologies, as well as in productive uses of energy in agriculture. For example, solar energy can be used for cooking as well as pumping and irrigation leading to extra harvest rounds and increased crop production, and for charging mobile phones that provide access to weather and market information, and mobile payments.

Policy priorities for ending hunger and providing food security

• *Document, advertise and further support successful cases* where attention has been given to food-energy interlinkages, and the WEF Nexus approach has been applied, highlighting socio-economic benefits.. Fill knowledge and data gaps, in particular through support to knowledge platforms and improvement of data collection relevant to the WEF sectors.

• *Invest in access to energy, especially off-grid energy and mini-grids* to support productive uses of energy in the agriculture sector. Strengthen financial support to SMEs that embrace the WEF Nexus approach, paying particular attention to gender issues and support for women entrepreneurs. Tailor business models to specific country and community conditions, and use innovative financing instruments focused on promoting water and energy interlinkages for effective transfer of technologies and knowledge. Strengthen the capacity of national and local decision makers relevant to the WEF sectors, as well as communities, building on existing structures and mechanisms as much as possible, but also seeking new avenues for collaboration. Keep fostering multi-stakeholder dialogues at all levels and with a wide variety of partners, including the private sector.

• *Strengthen participatory approaches and address power differences,* in particular regarding the implementation of WEF-related interventions at the local level, and promote horizontal and vertical coordination in planning WEF-Nexus activities.

• *Establish and promote standards and licensing of the energy appliances in the food sector.*

• *Promote close links between healthy diets and changes in cooking habits in the transition to clean cooking.*

• *Increase collaboration on data collection* and sharing between the various governmental institutions, and establish unified national databases that support the formulation of regulations and policies to further encourage greater interlinkages between the water and energy sectors.

PROTECTING THE PLANET AND BUILDING RESILIENCE

Energy accounts for two-thirds of total greenhouse gas emissions and 80% of carbon dioxide (CO2) emissions (IEA, 2019a). Therefore the energy sector must play a critical role in any efforts to reduce emissions and mitigate climate change under SDG 13.

Achieving universal access to electricity and clean fuels and technologies is not necessarily in conflict with achieving climate objectives. There is growing energy demand in underserved areas, where support is needed for additional productive uses of electricity for economic development. This need can be met effectively through greater utilisation of renewable energy and more efficient equipment, as well as creative design and innovative services to reduce demand.

Rapid deployment of renewables coupled with energy efficiency, as well as direct and indirect electrification, can achieve around 90%of the emission reductions needed in the energy sector by 2050. At the same time, these actions can advance economic growth, development and welfare (IRENA, 2020). Growth in energy-related CO2 emissions from 2014 to 2016 was flat, but estimated emission levels increased by 1.75% in 2018 to reach a historic high of 33.1 gigatonnes (Gt), with the power sector accounting for nearly two- thirds of the emissions growth (IEA, 2019).

Currently, the world is not nearly on course to meet the well below 2°C climate objective, and even further from attaining the aspirational target of limiting warming to 1.5°C. Only through the consistent use of renewable energy and energy efficiency measures, including the implementation of SDG 7, can SDG 13 be met. Therefore, we need to create a framework to massively expand renewable energy and widely integrate energy efficiency measures.

A transition to clean cooking will have numerous benefits, including with regard to climate. Currently 1 Gt of CO2 per year (about 2% of global emissions) is related to the use of non-renewable wood fuels for cooking. Cooking, heating, and lighting together emit up to 58% of global man-made black carbon emissions, a significant contribution to climate change (IIASA GAINS, 2017). Many of today's more modern stoves are highly efficient and, through a combination of lower fuel use and cleaner combustion, can reduce black carbon emissions by 50% to 90% (Garland et al., 2017). The Intergovernmental Panel on Climate Change (2018) has found that reducing black carbon, methane, and other short-lived climate pollutants would not only have substantial co-benefits on health and air pollution but could, in the short-term, contribute significantly to limiting global warming. Immediate and drastic cuts in CO2 emissions are needed to achieve the long-term goal of limiting warming to 1.5oC above pre-industrial levels, which is estimated to be critical for avoiding the most dangerous impacts of climate change.

Policy priorities for protecting the planet and building resilience

Current commitments to renewable energy and energy efficiency are insufficient to achieve the 2030 Sustainable Development Agenda and the Paris Agreement, therefore governments should implement radical measures. There are numerous potential synergies and trade-offs between climate action and sustainable development. These synergies and trade-offs can be managed in order to deliver the best possible outcome.

• *Establish ambitious renewable energy and energy efficiency targets*, linked to goals for access to electricity and cooking, but also covering other energy services. Regional initiatives, such as the African Renewable Energy Initiative (AREI), provide models for expansive and inclusive efforts to accelerate and scale up renewable energy.

• *Set up enabling frameworks and policies to massively scale up renewable energy and energy efficiency, and to increase private investments* in this area, aligning energy infrastructure investments with 1.5°C pathways. Direct mechanisms and complementary policies to promote renewables and energy efficiency should include support mechanisms such as: schemes

that provide additional payments for renewable electricity generation on top of usual market revenues; performance standards for buildings, including for lighting, windows, ventilation, and heating and cooling systems; and fiscal instruments such as tax exemptions or tax breaks for appliances and energy efficiency improvements.

• *Set clear goals for on-grid and off-grid financing to ensure balanced financial flows.* This is crucial for scaling up renewable energy and energy efficiency. Capacity building and skills development should go hand in hand with this scale-up. Making concessional finance available at a greater scale to developing countries through MDBs and other channels is also important.

• *Offer energy efficiency loan programmes to remove the upfront costs of energy investments,* using revolving green loans or on-bill repayment schemes. This would minimise barriers to mobilising financing for energy efficiency. According to IRENA (2020), a pathway to deeper decarbonisation requires total energy investment of up to US$ 130 trillion, but the socioeconomic gains of such an investment would be massive.

• *Adopt carbon pricing* to stimulate clean technology and market innovation, to support new, low-carbon drivers of economic growth.

• *Phase out fossil fuel subsidies*, including through strategic alliances, such as the World Bank's Energy Subsidy Reform. The low oil and gas prices in the wake of the COVID-19 pandemic provide a unique opportunity for this. However, careful economic planning is needed to successfully reform energy subsidies without impacting affordability and hence energy access for low and middle-income groups, and without disrupting industry competitiveness.

• *Revise SDG 7 indicators for 2030 and beyond by creating more ambitious targets and mid-term measures* linked to other SDGs. For SDG 7.1, it is essential to integrate productive uses and economic development with improved health services. For SDG 7.2, there should be a target for renewable energy deployment, accelerating the current pace of deployment six-fold (IRENA, 2020). For SDG 7.3, the pathways to achieve an adequate energy efficiency supply should be displayed.

• *Reach for carbon neutrality of economies by 2050.* Think big: climate neutral development pathways are feasible and competitive. Low carbon resilient infrastructure is now more cost effective than conventional infrastructure and avoids the risks of stranded assets. 100% decarbonisation is technically and economically viable. It will require innovation, a higher degree of digitalisation, and electrification of end-use. It will also involve sector coupling through integration of renewable energy solutions and enabling technologies for the transport, heating, and cooling sectors. Intersectoral planning is the key for achieving the Agenda 2030 and thus, we need to consider the close linkages between water, energy, and food security for sustainable development.

Sharing economic benefits

In recent times, economic growth has been deeply unequal. There has been an unprecedented increase in wealth, and wider income disparities in many countries, primarily driven by concentrations at the top. The richest 1% of the world's population held 33% of the total wealth on the planet in 2017. For the lowest quarter of the global population, the share was only about 10% (GSDR, 2019).

Renewable energy can offer a sustainable, low-carbon climate-safe foundation for stable, long-term economic development. Transformation of the energy system would result in higherGDP growth, 2.4% more by mid-century than current plans would reach (IRENA 2020). It would also bring an increase of jobs in renewables, reaching up to 42 million globally by 2050, four times more than today. People's well-being would improve faster and further, with a 13.5% higher welfare indicator by 2050 compared to what current plans would reach (IRENA, 2020).

While some countries and regions are on track to achieve electricity for all, under current policies and trends, 2.3 billion people will still lack access to clean cooking facilities in 2030 (Tracking Report, 2020).

Women and children would particularly benefit from reductions in energy poverty. It is their unpaid time and labour that is expended to gather biomass fuels for cooking, collect water, and manually process grains and other foods. They are also the ones most affected by household air pollution linked to burning fuels such as wood, animal waste and charcoal, which

is responsible for about 2.8 million deaths every year, mostly among women and children. Greater access to and agency over energy services can improve women's health and well-being, free up their time and enable their economic empowerment, thereby supporting the achievement of SDG 5.

Cultural and social norms are major barriers for women in areas where modern energy services are limited, and these will need to be reviewed. Overall, there is a lack of gender-sensitive programmes and policies, insufficient skills and training opportunities, inequity in ownership of assets, and lack of access to finance (IRENA, 2019b).

In recent years, women have been playing important roles in expanding energy access, moving beyond their traditional role as "users" and "beneficiaries," and becoming part of decision-making processes, and solutions. A number of actors have started working on the intersection of gender, energy and sustainable development, and advancing gender equality, social inclusion and women's empowerment in the energy sector. However, women are still under-represented in the sector.

Policy priorities for sharing economic benefits

• *Integrate gender and energy actions within all SDGs.* Establish gender-responsive global and national energy sector policies backed by evidence, such as sex-disaggregated data and analysis. Continue to raise awareness on gender issues across the energy value chain, including in off-grid distribution and consumption, policy/pricing, and generation and energy production, and include women throughout the chain as actors and agents of change. Energy ministries and utilities should be supported in developing gender-responsive programmes, monitoring systems and data collection methods.

• *Promote and invest more in clean cooking technologies and decentralised sustainable energy technologies* that support gender equality and women's economic empowerment, and involve women in the design and distribution of modern energy equipment and services. Within the energy industry itself, barriers to women executives, entrepreneurs and employees must be removed, and their representation increased on national and global energy bodies.

• *Increase government efforts to promote women-centric business models for expanding energy access to all,* including at the last mile, through capacity-building, partnerships with local stakeholders, expanding women's access to finance, and building a conducive enabling environment for women entrepreneurs.

• *Support integration of gender concerns in international and national energy and climate change programmes and mechanisms,* such as the Green Climate Fund and Nationally Determined Contributions. Meaningfully integrate gender concerns into programming concerning off-grid energy solutions and, renewable energy access programmes to reach more remote or low-income households.

• *Limit job losses in the transition from fossil fuels to renewable energy,* and work towards a widespread transition to jobs in the sustainable energy sector, including through relevant vocational training for existing workers and for young people.

• *Promote access to education and skill building related to renewable energy,* in order to provide opportunities for all segments of society, including the poor, women and other marginalised groups. This requires building partnerships between governments, educational institutions and the private sector in order to improve the available learning content as well as the accessibility of programmes.

BOLSTERING LOCAL ACTION TO ACCELERATE IMPLEMENTATION

SDG localisation involves defining, implementing and monitoring strategies adopted at the local level for achieving global, national, and subnational goals. It encompasses setting goals and targets, determining the means of implementation, and using indicators to measure and monitor progress. While the SDGs are global in their coverage, their achievement will depend on their effective translation into national policies, and implementation through concrete actions at the local level.

Cities and provinces are ideally positioned to transform these global goals into specific projects, in line with related national policies. Cities usually have sufficient decision-making autonomy to develop projects and, at the same time, offer good understanding of the local context for identifying most appropriate solutions. It has been estimated that without the involvement of local tiers of government, approximately 65% of the SDG targets may not be achieved.

If current trends continue, cities will contain approximately 70% of the world's population and produce 85% of global economic output by 2050. Cities are responsible for 70% of the global greenhouse gas emissions from burning fossil fuels, and will need to become carbon neutral if the world is to achieve the targets contained in the Paris Agreement.

If development continues in the business-as-usual model, by 2050 the cities of the world will consume 90 billion tons per year of raw materials, such as sand, gravel, iron ore, coal and wood. That will have irreversible consequences on the depletion of those finite resources, and will mean the destruction of many natural habitats and green spaces, and resulting loss of biodiversity. In many cases, urbanisation is proceeding organically, without planning, and since urban centres concentrate in coastal areas, urban residents live with a high risk of flooding, mudslides and other disasters (GSDR, 2019). Strengthening climate resilience and adaptation measures will be particularly important for vulnerable populations in coastal cities.

In addition, cities give rise to severe income disparities and extreme inequalities in health, food security, housing, education, access to meaningful social and cultural lives, and fulfilling work.

However, much urbanisation takes place in areas where new infrastructure is being built, allowing for novel, sustainable solutions. Policy and investment decisions made today will have a deep and long-lasting impact on energy and water systems, transportation networks, buildings and other infrastructure. A 2030 Agenda city will be compact and accessible to all (including women, youth, persons with disabilities and other vulnerable populations), with sufficient public transit, a flourishing economic base with decent jobs for all, accessible digital infrastructure, and mixed land use (including residential, commercial, educational and green public spaces). Strengthening healthcare facilities to prevent and adequately address public health emergencies will also be critical to the future sustainability of cities.

More than 1,000 cities signed the Paris City Hall Declaration in 2015 to support urban emission reductions through renewable energy adoption. 102 cities around the world have committed to achieve net-zero emissions by 2050. Cities like Melbourne, Amsterdam and Copenhagen already aim to become carbon neutral before 2030, while Paris and San Francisco have set 100% renewable energy targets.

Reliance on fossil-fuelled transportation in tandem with poor urban planning and congestion contributes to air and noise pollution as well as greenhouse gas emissions. Increasing and accelerating the adoption of low-emission alternatives, such as electric vehicles (EVs) can help countries and cities improve air quality and reduce transport-related emissions. Government policy intervention is necessary to overcome challenges with EV adoption, including charging infrastructure and the sustainable use, recycling and disposal of batteries. Alignment between electric mobility and energy policy is critical for ensuring EVs are charged by low emission energy sources while limiting disruption to local grids. Capacity at the local

level is critical, as cities are key actors in the implementation of EV policy.

Policy priorities for bolstering local action

• *Democratise the energy sector so it is responsive to a range of stakeholders* and held accountable for provision of clean energy in an equitable and inclusive manner. Engagement of the private sector is key, as well as public education and awareness-raising, social mobilisation for action, sufficient resources to support implementation of local actions, and locally-determined solutions.

• *Support SMEs, entrepreneurship and clean technology innovation at the local level*, to enhance local development and job creation, especially for energy and transportation. Strategies should focus on place-based innovation, mobilising local stakeholders' knowledge for application of innovative approaches and technologies.

• *Align energy, transportation and industrial policies to ensure that barriers to electric vehicles are overcome,* and charging infrastructure is supported by low-emission sources of electricity. A multi-stakeholder and market specific approach that includes local actors is necessary to accelerate the adoption of electric vehicles.

• *Develop SDG localisation frameworks at the city level with a focus on SDG 7*, as well as institutional and policy mechanisms to coordinate SDG-related actions between national, subnational and local levels of governance.

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REGIONAL **PERSPECTIVES**

VI.

POLICY BRIEF

ACHIEVING ACCESS TO CLEAN AND AFFORDABLE ENERGY IN AFRICA

Contributing organisations:

UN Economic Commission for Africa (ECA), International Renewable Energy Agency (IRENA), International Institute for Applied Systems Analysis (IIASA), Food and Agricultural Organization of the UN (FAO), African Energy Commission (AFREC), African Union Commission (AUC), Global Electricity Interconnection Development and Cooperation Organisation (GEIDCO), Centre for Complex Systems in Transition (Stellenbosch University), Thomro Biofuels (Zambia)

KEY MESSAGES

Energy demand in Africa continues to grow owing to various factors, including population growth, economic development, industrialisation, climate change and trade. This growth in demand presents challenges in mobilising the substantive and transformative investments needed. It also offers an opportunity for Africa to close its vast energy deficit with transformative business models that make the continent a leader in green growth and the global energy transformation.

COVID-19

The COVID-19 pandemic has brought more urgency to addressing Africa's energy access deficit. Without secure, reliable and quality access to power, the region's health systems and related infrastructure cannot function, especially during a pandemic situation. African countries have the opportunity, especially under the financial challenges and reduced fiscal space caused by the pandemic, to build back better with resilient energy systems that not only address access and climate change but also spur economic growth and employment.

Access to electricity

Many African countries continue to make progress with increasing access to electricity. The number of people without access has been reduced from over 600 million in 2015 to about 540 million in 2019. However, at current levels of ambition, investment and policies, about 500 million people will still lack access to electricity in 2030. Urgent investments are needed in off-grid and transboundary power systems to rapidly close the energy access gap while capitalising on the continent's abundant and variedly distributed energy resources.

Access to clean cooking

Lack of access to clean cooking solutions remains a chronic challenge in Africa, with over 900 million people still in need of improved cooking facilities. Transformative innovations in technologies and business models are needed, with targeted interventions for maximum impact for both rural and urban populations.

Renewable energy

Africa remains the last global frontier for transformative clean energy investments. A few countries (including Kenya, Morocco, Senegal, South Africa and Zambia) have demonstrated leadership in promoting investments in clean energy development through policy and regulatory reforms. These countries are capitalising on the global decline in the cost of renewable energy technologies, which has resulted in some of the lowest solar power tariffs globally. However, there is more to be done. The Economic Commission for Africa's 'SDG 7 Initiative for Africa' (based on sustainability, governance and finance) supports African countries in powering their economies principally with clean energy, while also addressing access challenges and meeting climate change commitments.

Energy efficiency

For energy efficiency improvements, the continent is not capitalising enough on the low-hanging economic opportunities available. Policymakers need to implement and enforce policies to promote energy efficiency in various end-use sectors.

Policy recommendations

Policy and regulatory reforms addressing governance barriers in the energy sector are needed to attract investment. Countries should consider recent successes and experiences within the continent regarding regulatory reforms for leveraging limited public resources to mobilise the necessary investments from the private sector. The private sector needs to recognise the investment opportunities in Africa and move past the false perception of high investment risks. Policymakers, development partners and DFIs can aid with this through appropriate risk mitigation instruments. Finally, policymakers, development partners and the private sector need to work together to strengthen the institutional and human capacity related to energy and investment planning.

UPDATE ON THE CURRENT STATUS

This policy brief provides an update on the performance and prospects of African countries in achieving the targets of the Sustainable Development Goal 7 on clean, affordable and modern energy. It presents a snapshot of progress on electricity access, clean cooking, renewables and energy efficiency, as well as the interlinkages between SDG 7 and other SDGs. It highlights what is needed to fill the gaps.

Countries in Africa have made commendable efforts to address their considerable deficits in access to clean and affordable energy. There are many current programmes on energy generation at the continental, regional and country level. African governments mainly spearhead these programmes with support from development partners and international organisations. Private sector investment and participation in energy infrastructure, particularly in electricity generation, has risen gradually through independent power producers (IPPs). Almost all the countries in the African region are undertaking power sector reforms with the view of increasing further investments in the sector, as well as tapping into private sector skills and resources.

However, 2030 will be too soon for most African countries to achieve universal access to electricity, even at a Tier 1 level.[1] Access to clean fuels appears to have stagnated and has not shown significant improvement since 2015. This is partly because of the dominant role of biomass for cooking in most African countries, especially those with the highest populations. As the priority for many African countries is increasing modern energy access, the focus on energy efficiency is minimal at this point, even though it would provide many synergies with the other targets.

Below is a summary on the status of electricity access, clean cooking fuels and renewable energy. The situation with regards to energy efficiency in Africa has not changed significantly since the previous policy brief (2019) and is not presented here.

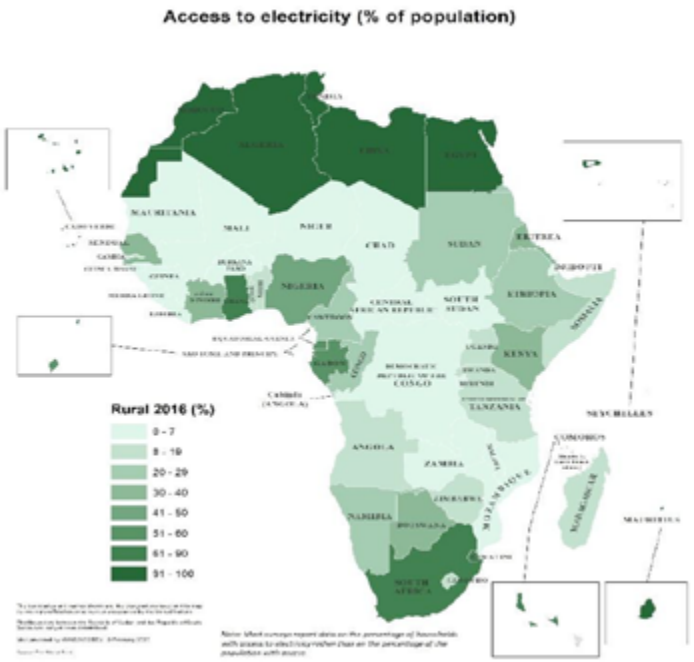
Electricity access

Despite notable investment in the power generation over the years, access to electricity remains at 47% in Africa (excluding North Africa). Progress since 2015 has been slow – showing an increase of just 13% up to 2018. Currently, 548 million people do not have access to electricity, even at the Tier 1 level. The most substantial access deficits are in Nigeria, the Democratic Republic of Congo and Ethiopia, which are among the most populous countries in Africa.

Despite the large numbers of people in Africa without access to electricity, several countries have made significant strides since 2015. For instance, in the 2010-2018 period, Kenya's electricity access rate had an annual growth of 7%. Other countries showed an increase of 3% to 4% over the same period, including Eswatini, Uganda, Lesotho, Congo, South Sudan, Rwanda, Mali, Guinea Bissau and the Central African Republic.

Rural electricity access presents a formidable challenge, particularly in countries with high populations and limited resources. Urban electrification increased from 69% in 2010 to 77% in 2018. For rural electrification, there was a modest increase, from only 14% in 2010 to 27% in 2018. Several African countries have impressive off-grid electrification rates, such as Cabo Verde, Ghana, Gabon, Comoros, Kenya, Mauritius and Seychelles.

1 The Multi-Tier Framework has a multi-dimensional definition of access as "the ability to avail energy that is adequate, available when needed, reliable, of good quality, convenient, affordable, legal, healthy and safe for all required energy services". That is, having an electricity connection does not necessarily mean having access to electricity under the new definition, which also considers other aspects, as reliability and affordability. Energy access is measured in the tiered-spectrum, from Tier 0 (no access) to Tier 5 (the highest level of access) (https://www.esmap.org/node/55526).



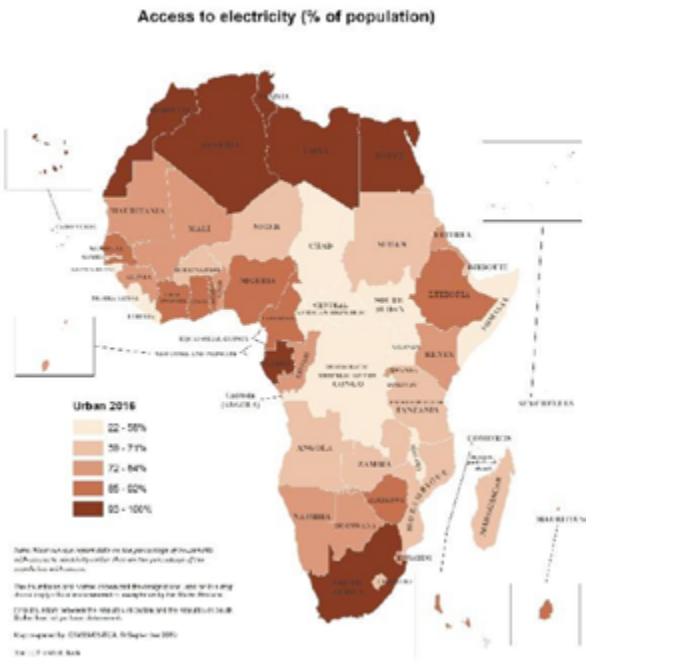


FIGURE 1: ACCESS TO ELECTRICITY IN AFRICA (COMPILED BY ECA AND ADAPTED FROM VARIOUS DATA SOURCES)

Beyond national reporting on electrification levels, recent efforts to track electricity access using satellite-based nightlights, population and land cover data provide an essential complement to survey-based estimates.[2] An assessment of changes between 2014 and 2019 reveals that more than 115 million people gained access to electricity in Africa. However, to achieve universal access by 2030, the pace of electrification needs to near triple so that 75 million people gain access each year till 2030, compared to the average 22 million newly electrified people per year for the 2014-2019 period. Moreover, among those with access to electricity, a vast distribution across access quality tiers exists. For instance, in some countries, where rapid electricity access growth has been reported (e.g. Kenya), the estimated final use remains very limited among newly electrified households.[3]

Access to clean cooking fuels

Over the last decade, there have been minimal improvements in clean cooking in Africa. In 2018, 894 million Africans or 85% of the population did not have access to clean cooking fuels (Figure 2).

Increasing access to electricity has not led to a massive transition to clean cooking. Most African countries still rely on biomass for cooking, in the form of wood and charcoal. According to AFREC, the share of firewood production increased from 190 937 kt in 2000 to 656 865 kt in 2017.[4]

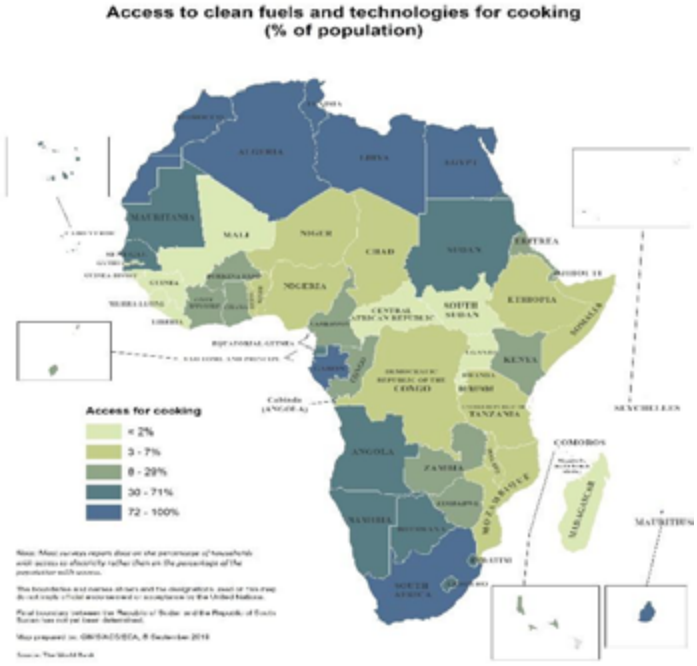


FIGURE 2: ACCESS TO CLEAN COOKING FUELS AND TECHNOLOGIES (COMPILED BY ECA AND ADAPTED FROM VARIOUS DATA SOURCES)

2 See Falchetta et al., 2019 https://doi.org/10.1038/s41597-019-0122-6

3 See Falchetta et al., 2020, https://doi.org/10.1016/j.oneear.2020.03.007

4 https://drive.google.com/drive/folders/1wrnIq9S6NIsaHUFui-7M2sHRjNf7Ulhbw?usp=sharing

Decisive policy interventions are needed to curb unsustainable cooking practices, particularly the unregulated production and use of charcoal, as this has health implications as well. Prohibition of charcoal production has mainly promoted illegality in its production, transportation and marketing.[5] Meanwhile, rapid deforestation (unsustainable use of forest stocks) is making biomass cooking less affordable.[6]

Renewable energy

The IRENA's Africa 2030 Roadmap for renewable energy estimates that Africa could meet nearly a quarter of its energy needs from indigenous and clean renewable energy by 2030. Modern renewables amounting to 310 GW could provide half the continent's total electricity generation capacity, representing a sevenfold increase from the 42 GW capacity in 2017. A transformation of this scale in Africa's energy sector would require an average investment of US$ 70 billion annually to 2030. The continent has proven and economically feasible renewable energy resources in hydro, solar, wind, geothermal and bioenergy, and over the years, the power generated from renewables has become cost competitive. The increasing number of IPPs across Africa demonstrates this, as well as the resultant competitive tariffs, e.g. US$ 0.06 per kWh for the 72 MW World Bank/IFC Scaling Solar programme project in Zambia.[7]

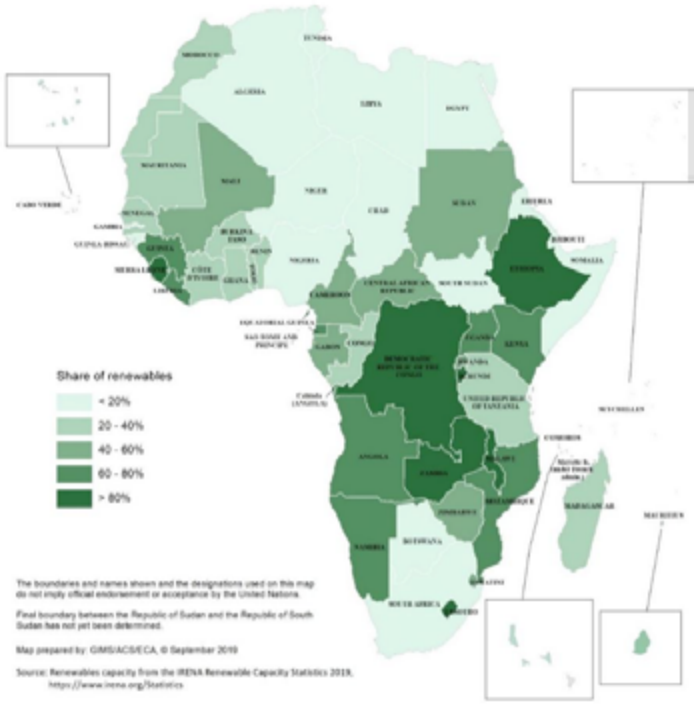


FIGURE 3: SHARE OF RENEWABLES

For new access in areas where the transmission and distribution infrastructure would need to be built, off-grid renewables might present an equally good, if not better, means for electrification. The off-grid solutions have a lower levelised cost of electricity (LCOE) than grid-based solutions for new electricity access once transmission and distribution costs are factored in.[8]

Robust policy choices and decisions need to be made for African countries to realise the potential of renewables, and to change the current biomass-dominated energy landscape. This includes power sector reforms to attract private capital for renewable energy power generation. The focus should also be directed at improving power transmission and distribution, including through new investment and necessary policy and regulatory frameworks for mini-grids and off-grid power technologies.

Are we on track to achieving SDG 7?

Since 2010, there has been a doubling of efforts at the country level to improve energy infrastructure. Development partners and other international institutions should continue to partner with countries in a range of programmes and projects to improve power generation, mainly focusing on renewable energy. These programmes not only focus on hard infrastructure but also deal with soft infrastructure such as enabling policies, regulations and legislations that govern the electricity sector. They include the AUC's Programme for Infrastructure and Development in Africa (PIDA), with its partners AfDB, AUDA-Nepad, ECA and the African RECs, plus the World Bank's Scaling Solar Programme, USAID's Power Africa, IRENA's Africa Clean Energy Corridors, and GEIDCO's initiative on African interconnections. Together, these initiatives would help individual countries to move closer to the goal of universal access to energy services, particularly in increasing modern energy access and the share of renewables. However, the continent started from a low base, and significant challenges remain.

5 http://www.fao.org/3/ca7967en/ca7967en.pdf
6 ECA 2018. EAC Energy Security Policy Framework
7 ECA 2020. The SDG7 Initiative for Africa: Accelerating clean energy investments for access and climate ambition in Africa
8 https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Jan/IRENA_2017_Power_Costs_2018.pdf

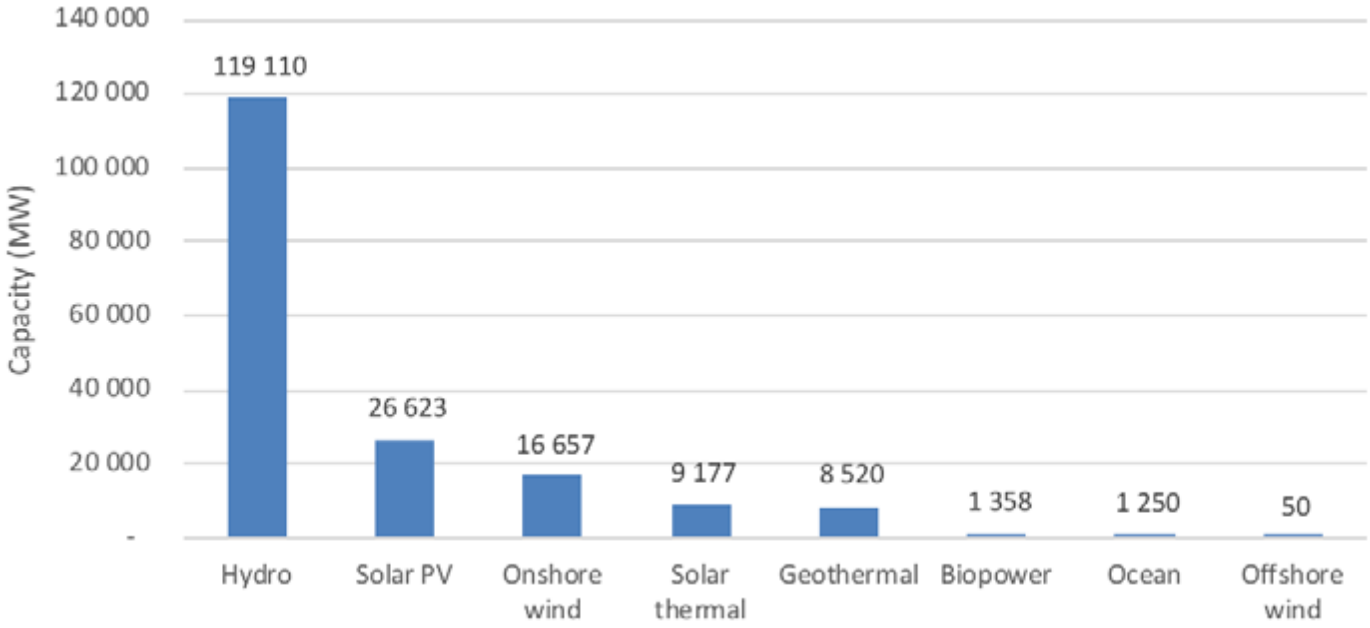


FIGURE 4: CLOSE TO 200 GW OF RENEWABLE POWER CAPACITY ANNOUNCED, PROPOSED OR UNDER CONSTRUCTION IN AFRICA AS OF 2019 (ANALYSIS BY ECA)

Still, some countries could achieve one or two of the SGD 7 targets. North African countries have achieved universal access, including access to clean cooking fuels and renewable energy in their energy portfolios. Challenges there include energy efficiency as well as energy security. For the rest of the continent, some countries are on track in achieving one or two of the SDG 7 targets, particularly electricity access and share of renewable energy. The current data shows that even though several countries may not achieve the SDG 7 objective in totality by 2030, significant strides have been made, and efforts are showing the improved energy scenario in many African countries.

COVID-19

The outbreak of COVID-19 has the potential of further delaying the efforts of African governments to achieve the SDG 7 targets. This pandemic is likely to have impacts on governments' short-term plans and strategies, current energy initiatives, and on funding/investment plans by both governments and development partners. Travel restrictions, lockdowns and border closures also hamper the movement of foreign workers, production and transportation of construction material, and work at construction sites, thereby delaying progress in projects. However, the crises might also afford an opportunity if rescue and recovery packages and international aid flows are directed to green investments and sustainable infrastructure expansion.

KEY CHALLENGES

Access to modern energy enables the attainment of vital socioeconomic goals, beyond lighting and a few other applications. It ensures food and water security, better healthcare, particularly in rural areas, and creates sustainable jobs for the youthful population of Africa. It also catalyses reindustrialisation and ensures that the extraction, conversion and use of energy resources do not have negative impacts on the environment. How these goals are delivered would depend upon the energy implementation strategy that the continent pursues.

Critical challenges that impact on the attainment of other SGDs include, but are not limited to, the following issues.

Rural electrification through mini-grids

Only a few countries in Africa (except in North Africa) have a good track record in providing sustainable energy in rural areas. Those countries that have good rural electrification programmes include Cabo Verde, Ghana, Gabon, Comoros, Kenya, Mauritius, South Africa and Seychelles. However, most of these countries have a small rural populace that makes it easy to extend power.

Considering that almost 60% of Africans reside in rural areas, rural electrification should be high on the priority lists of African policymakers in short to medium term. It should also be aimed at providing energy for community facilities and productive uses to enhance rural socioeconomic development.

The provision of mini-grids is one of the best strategies for rural electrification. However, for mini-grids to be successful, several issues must be resolved. These include:
a) Addressing high up-front infrastructure and installation costs;
b) Deciding on the best models for operating mini-grids in particular contexts (for example, public utility, private developer, community-owned scheme, or a hybrid approach); and
c) increasing the ability of households and other users to pay for electricity, so that the prescribed tariff can be attractive to private developers.[9]

The regulations should also address the operational modalities and compensation mechanism for eventual grid arrival.[10] Included in these interventions is the provision of energy-efficient equipment, the setting of energy efficiency standards or labels and information campaigns. Modular technologies provide an opportunity also to develop such minigrids to scale with changing demands and avoid the issue of stranded assets should the central grid extend to these areas in the future.

Energy-food-climate nexus imperatives

The SDGs are collective efforts tailored to improve human wellbeing and overcome the poverty, food scarcity and chronic energy deficits that prevail in some parts of the world. The interconnectedness of these issues requires systemic thinking in dealing with them. Harnessing the nexus of different systems requires framing the benefits, co-benefits, and trade-offs in demonstrating the investment opportunities that could be derived from the interaction of the systems.

In the context of food and energy security, a nexus approach has potential for improving cooperation and collaboration among different stakeholders, sectors and actors. Addressing the energy deficit that prevails in Africa, for example, could reduce the deforestation related to gathering fuelwood, which amplifies climate impacts in flash floods, and diminishes agricultural production through soil erosion and loss in soil fertility. Similarly, in addressing food security, there are opportunities for energy production using biogas and cellulotic biofuel as renewable sources of energy beneficial to the climate system. Improved energy access, even by decentralised solutions, increases energy availability and creates value across the agriculture-food value chains. Geothermal energy can be used to heat greenhouses and sterilise the soil, creating growing environments suitable for food production in locations where natural conditions would not normally allow it. Kenya's Geothermal Development Company has implemented four pilot projects for greenhouse heating, milk pasteurisation, aquaculture pond heating and a fifth project featuring a grain dryer is under development.[11]

Climate change impacts will need to be considered in future power plans (e.g. hydropower generation capacity impacted by changes in precipitation). For both the supply and the demand side, efforts to provide energy-efficient equipment should be extended.

Strengthening institutions, policies and regulations

The COVID-19 pandemic underlines the importance of Africa moving forward with implementation of its energy expansion programmes, as well as tapping into more of its own financial and human resources.

There should be commitments to strengthen implementing agencies at four levels:

9 https://www.odi.org/blogs/10730-how-solar-mini-grids-can-bring-cheap-green-electricity-rural-africa
10 https://www.irena.org/publications/2018/Oct/Policies-and-regulations-for-renewable-energy-mini-grids
11 https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Geothermal_agri-food_2019.pdf

a) Enhancing the capacity of local implementing institutions, especially their technical competence, to implement enabling policies.
b) Reviewing current policies that support energy access, and assessing their robustness in different scenarios, including the present pandemic scenario.
c) Accelerating the power sector reforms that African countries are undertaking, particularly the regulations that facilitate participation and investment by the private sector in the power industry – with an emphasis on the local private sector.
d) Accelerating policies, actions and measures towards localising energy technologies, paying attention to the support of regional systems for technology innovations.

Local capacities should be enhanced so that the continent would have an adequate supply of qualified labour along the whole value chain for energy project conception, development and operation.

Integrated energy planning

Sustainable energy drives economic development, accelerates social progress and ensures environmental sustainability in its extraction, conversion and use. It benefits African countries when the policies and plans of the energy sector are harmonised to meet socioeconomic objectives, and energy subsectors are coordinated to achieve maximum impact. Energy planning should not be done in isolation but integrated within economic and social sectors. For instance, there could be close coordination of policies on clean cooking fuels with actions on improving health, as access to clean cooking technologies improves the health conditions of households. Integrated energy planning ensures that energy interventions strengthen interlinkages, and interventions in the sector materially improve the performance of other economic sectors.

HOW TO FILL THE GAPS TO ACHIEVE SDG 7 AND STRENGTHEN INTERLINKAGES

Further energy planning in Africa should take into consideration the impacts of COVID-19 and revise targets accordingly. African countries could be operating in a financially constrained environment, which would compel them to mobilise resources internally to push forward programmes and projects for developing their energy infrastructure. However, African countries cannot afford delays in bridging the energy access deficit, as adequate and secure energy is central to recovery plans for all countries.

The interlinkages between the SDG 7 objectives and other SDGs are very clear, more specifically: advancing human wellbeing (SDG 3); achieving food security for all and ending poverty (SDGs 1 and 3); following a path of climate-friendly development (SDG 13); bolstering industrialisation (SDG 9) and strengthening local action to accelerate implementation.

Almost all African countries have submitted their Nationally Determined Contributions (NDCs) or Intended Nationally Determined Contributions (iNDCs) and most of them reference energy objectives to be achieved.[12] It is essential for achieving climate targets, and the SDGs, to strengthen national institutions, facilitate integrated energy planning, and favour cooperation with international organisations and financial institutions to work on the achievement of these NDCs and iNDCs.

The following are some of the actions that could be undertaken to bolster interlinkages:

Address overreliance on biomass

First and foremost, overreliance on traditional bio-

12 http://www.fao.org/3/ca6359en/ca6359en.pdf

mass needs to be addressed through firm policies, measures and actions to reduce its use. Continued over-reliance on biomass undermines the gains made in increasing electricity access in many Africa countries because:
a) It limits social progress, as women and girl children currently expend considerable time and effort in fuelwood gathering.
b) It has adverse health implications, as burning biomass is causing respiratory diseases.
c) Harvesting fuelwood is responsible for the deforestation of the countryside.

Following the African Union Summit in 2013, AU, ECA, African Union Development Agency (AUDA)-Nepad and other regional partners initiated a programme to modernise the sector. For the 2020-2030 period, there is a need to accelerate this initiative, particularly addressing biomass usage at the country level. Support from other initiatives such as the Global Energy Partnership is particularly needed in Africa to transform the biomass subsector so it can play a decisive role in increasing access to sustainable energy, employment and income-generation opportunities. Recent research evidence suggests that in addition to government subsidies on cleaner fuels and stoves, cash transfers and other social assistance policies are essential to make these options affordable and enable a transition to clean cooking for all.[13]

Strengthen planning capacities for policymakers

Moving forward, African institutions could assume more responsibility in planning energy infrastructure, implementing projects and programmes, financing projects, and managing operations. Over the next ten years, support should be given to countries to enhance the capacity of policymakers in the area of energy planning and interlinkages with other development goals. There are already initiatives by international organisations to assist with modelling, particularly for electrification expansion and energy mix. Such capacity-building programmes need to be accelerated. International organisations can play a role in ensuring that there is the coordination of these programmes and that they are tailored to the specific conditions existing at the country level.

Diversify investments and increase private sector participation in energy infrastructure

More than in any other period, increasing access to safe and reliable energy could face tremendous financial constraints. COVID-19 could also bring on an economic recession, which could have dire impacts in Africa. Many countries on the continent might have to divert funding meant for infrastructure to address immediate social welfare issues. Therefore, private capital (and skills) would be critical in building and operating energy infrastructure in Africa. Enabling the policy environment for private sector participation should, henceforth, be the priority. International organisations and development banks should assist countries in their power sector reforms, mainly focusing on enabling regulatory frameworks to improve readiness, openness and attractiveness of the power sector to private companies.

Initiate regional and continental approach to mini-grids

The largest energy deficits are in rural areas, which is where many Africans live. In terms of electricity access, as well as access to clean cooking fuels, rural areas fare worse compared to urban areas. This urban-rural divide could make many countries on the continent miss their SDG 7 targets. In the past two decades, there has been a plethora of initiatives, mainly the distribution of stand-alone systems such as solar lanterns, solar PV lighting kits and solar home systems in rural areas across Africa. While these initiatives are essential in bringing electric light in many rural homes, they have little impact on the overall economic and social transformation, particularly regarding income-generating activities. Full rural electrification cannot be realised without the deployment of mini-grids. Mini-grids can provide a local distribution supply system connected to domestic, business and institutional customers in a locality. However, this technology, although highly desirable, is costly in terms of up-front costs. Therefore, a regional and continental approach is needed for mini-grid deployment. This approach should focus on localisation of the technology, as well as on investments and operations. International organisations, such as ECA and others, could spearhead such a regional and continental approach.

13 See Poblete-Cazenave and Pachauri, 2018. https://doi.org/10.1016/j.eneco.2018.09.003

Strengthen partnerships for impactful implementation

Partly as the consequence of the COVID-19 pandemic, Africa must strengthen its modes of implementation, particularly regional partnerships. Also, the bulk of financial resources to fund energy infrastructure projects should be derived internally. These partnerships consist of the private sector, public institutions, African regional development banks and other financing institutions, academia and civil society. They can ensure equitable distribution of infrastructure projects across the continent, as well as shared benefits.

POLICY RECOMMENDATIONS

While not all African countries can meet the SDG 7 targets by 2030, some headway could be made in the short term, despite the additional challenges presented by COVID-19. Rebuilding with renewable energy and end-use electrification could provide independence from fossil fuel supply chains and create sustainable local jobs in Africa. It could offer the opportunity to start investing in local solutions, using local talents and initiatives, as so far, almost all investment promotion units in Africa have focused more on attracting and supporting foreign investment than on local resources.

It is recommended that African countries should:
a) Focus more on creating a favourable environment for energy investment by accelerating power sector reforms, particularly policy and regulatory measures that will attract the private sector into the energy supply value chain for both grid-connected and off-grid systems.

b) Implement comprehensive capacity building programmes that could cover project identification, preparation, and procurement as well as technical aspects related to the integration of variable renewable energy in power systems and training of relevant stakeholders on specific policy and regulations. These capacity-building programmes could also give policymakers and relevant stakeholders a detailed overview of current energy production and its potential to facilitate informed policy decisions.

c) Promote local entrepreneurship in the energy value chain, mainly providing incentives and other support structures for energy project developers. The AU and partners' initiative on developing an investment strategy for bioenergy project developers should be supported.

d) Encourage market development, consumer demand, and investments in the clean cooking sector through the promotion of innovative business and service models and financing structures targeting the public, commercial and household sectors.

e) Support the development of frameworks for national, regional and global investments in the energy sector and regional power interconnections, including investment promotion measures, fiscal and financial incentives, finance facilities and de-risking mechanisms, as well as project facilitation.

POLICY BRIEF

ADVANCING SDG 7 IN ASIA AND THE PACIFIC

Contributing organisations:

UN Economic and Social Commission for Asia and the Pacific (ESCAP) in collaboration with the Asian Development Bank, the World Bank, and the International Energy Agency (IEA)

KEY MESSAGES

The availability of modern and affordable energy has transformed the Asia-Pacific region, helping countries to develop their economies, and lifting millions out of poverty. However, there is continued reliance on polluting and carbon-intensive sources of energy. The Asia-Pacific region accounts for almost 60% of global total CO2 emissions, nearly two-thirds of which are from energy sector. The Asia-Pacific region accounted for 80% of the world's coal consumption in 2018, with demand mainly concentrated in China (50%), followed by India (12%), Japan (3%), and South Korea (2.5%).

Governments in Asia will need to reverse their current trend of expanding coal-fired generation capacity and instead urgently implement policies to enable a fast decarbonisation of the electricity mix. Strengthening governments' commitments to climate policy with plans that include a clear commitment to coal phase-out, removing subsidies for fossil fuels, and building support for renewables and energy efficiency will offer new opportunities for both developed and developing countries in the region to build low-carbon economies, with significant benefits for sustainable development.

Impacts of COVID-19

In response to the pandemic, the focus of many governments has been diverted away from clean energy. Demand for energy is down, which has boosted the renewable energy share in many countries. However, some renewable energy projects are stalled due to supply chain disruptions for components. As poor air quality appears to be a major risk for mortality from the virus, provision of clean cooking for rural populations takes on extra importance.

Access to electricity

Based on existing and planned policies, the Asia-Pacific region is set to achieve universal electricity access by 2030. However, in 2018 over 200 million people still had no access to electricity, around 5% of the region's population. Urban populations approached universal access (99.7%) in 2018, but people in rural areas lagged behind (92.2%). Off-grid renewable energy technologies represent a viable electrification solution in rural areas, with an emphasis on support for modern lifestyles and productive uses.

Access to clean cooking

The region has demonstrated slow progress in access to clean cooking. In 2018 around 1.8 billion people, or nearly 40% of the population, relied on polluting and unhealthy cooking fuels and technologies. The region is far from being on track to achieve universal access to clean cooking by 2030. Clean cooking targets must be integrated into national energy plans. New investments and additional resources are also needed to support the development of options that meet consumer needs and overcome barriers, such as costs and cultural preferences, while limiting government spending on subsidies.

Renewables

The share of modern renewables in total final energy consumption has been growing since the early 2000s, reaching more than 8% in 2017. This marked the first year that modern renewable energy exceeded traditional biomass in the energy mix, accounting for 52% of renewable energy in the total final energy consumption in Asia-Pacific. Use of modern renewables has been highly concentrated in the power sector, with hydropower accounting for three-quarters of the region's renewable electricity output. More attention is needed to increase the use of renewables in transportation and heating.

Energy intensity

The region has demonstrated a steep decline in energy intensity, registering an annual average decline of 2.6% from 2010 to 2017. This is on track with global annual reduction required in the lead up to 2030. If the region could sustain reduction rates at this level, the Asia-Pacific would be on track to meet the SDG 7.3 target. However, this would require continued government commitment to enhancing energy efficiency.

SDG 7 IN ASIA AND THE PACIFIC

The Asia-Pacific region had a population of 4.55 billion in 2018, about 60% of the world total. The economies in the region produce approximately one-third of the world's gross domestic product (GDP), consume half of the global energy supply and include the world's top energy producers and consumers. In 2017, Asia and the Pacific accounted for 55% of global emissions from fuel combustion, nearly two-thirds of which were from coal.

Despite facing many challenges, Asia-Pacific countries are demonstrating global leadership across the three main pillars of sustainable energy — access, efficiency and renewables — offering strong commitments and innovation in those areas. New technologies and approaches have emerged, and as the Paris Agreement has turned the world's focus toward decarbonisation, countries across the region have offered up new and increasingly ambitious targets to improve energy efficiency and to increase their renewable energy share.

Current Status

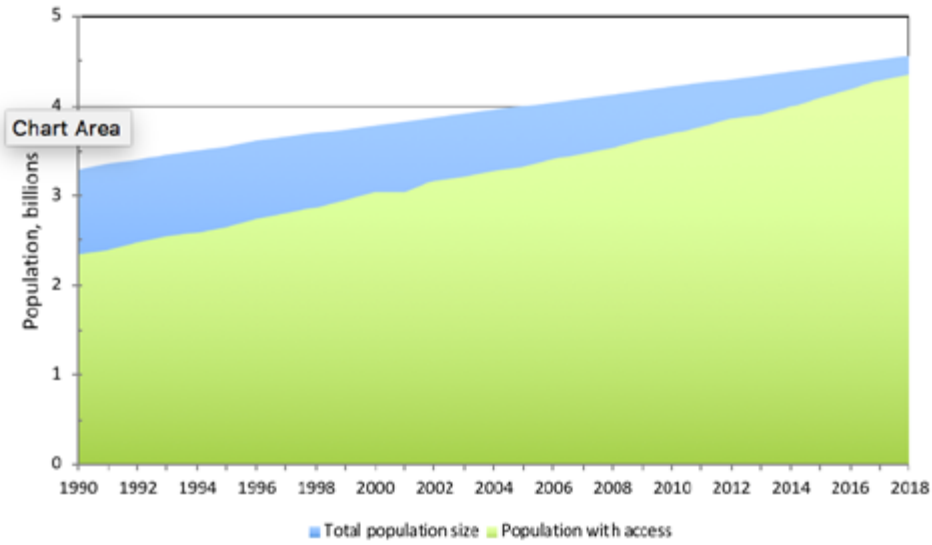
Electricity access

Policymakers across Asia and the Pacific have acknowledged that electricity is fundamental to socioeconomic development. Their policies and programmes have demonstrated significant progress in bringing electricity to all populations. In 2018, the electrification rate for the total regional population reached 95.6%, up from 87.3% in 2010. Recent accelerated progress resulted in an average annual growth in electrification of 1.2% between 2010 and 2018, as compared to 0.8% between 2000 and 2010.

Between 2010 and 2018, an additional 665 million people were provided access to electricity, raising the region's total electrified population to 4.35 billion. This has closed the electricity access gap to its narrowest point in history. However, more than 200 million people lacked access to electricity in the Asia-Pacific region in 2018. Although large, the size of this unserved population represents a decrease of around 80% compared to 1990 levels, despite sustained population growth (Figure 1).

There is still a disparity between electricity access rates in urban and rural areas, but the gap is closing

Figure 1. Access to electricity in Asia and the Pacific, 1990–2018



with advances in off-grid and mini-grid technologies. The overall urban electrification rate in Asia and the Pacific reached 99.7% in 2018, edging up from about 98% in 2010. At the same time, urban populations have grown rapidly. In rural areas, electrification efforts coupled with falling population sizes have increased access rates from 79.1% in 2010 to 92.2% in 2018.

Clean cooking

The Asia-Pacific region has made modest progress in expanding access to clean fuels and technologies for cooking. In 2010, 2.13 billion people, more than 50% of the region's population, were reliant on highly polluting and harmful cooking solutions. By 2018, access had expanded even as the population grew, and that figure had dropped to 1.8 billion people, or 41.2% of the population.

The pace of improvement at the regional level is

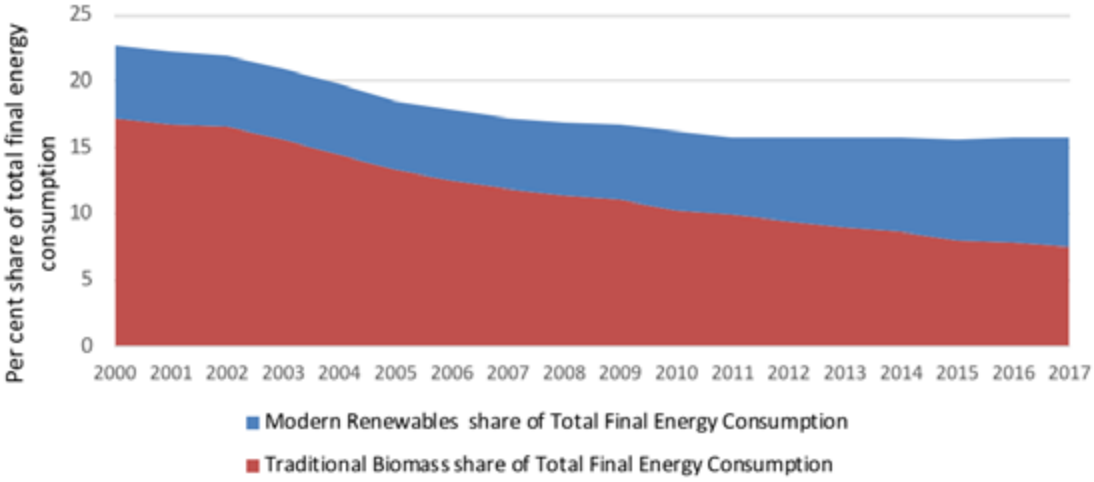
not rapid enough to reach universal access to clean cooking by 2030. To achieve that target, the average annual increase in the percentage of the region's households with access to clean cooking would need to increase more than threefold, from the 0.9% observed between 2010 and 2018 to approximately 3.4%.

Renewable energy

The renewable share of total final energy consumption in Asia and the Pacific showed a steady decline from 2000 to 2011, after which additional renewable energy supply generally began to keep pace with rising energy consumption. At the national level, the largest renewable shares of total final energy consumption are found among nations where populations remain dependent on traditional biomass for cooking and heating or where hydropower resources are abundant.

The share of modern renewables (i.e. the renewable component excluding traditional biomass) in total final energy consumption has been growing since the early 2000s, reaching more than 8% in 2017. This is the first year that modern renewable energy overtook traditional biomass, accounting for 52% in the total final renewable energy consumption (Figure 2).

Figure 2. Renewable energy share of total final energy consumption in Asia and the Pacific, 2000–2017



The largest gains for renewables are found in the region's power sector. In 2017, the renewable share of total electricity output in Asia and the Pacific amounted to 21.6%, up from 16.1% in 2010. Since then, there has been a steady increase in the share of renewable energy in the power mix. The region is keeping pace with a rising global trend, though Europe, Latin America and the Caribbean, and North America continue to have higher shares of renewable electricity, suggesting that there is potential for the Asia-Pacific region to make further gains.

Hydropower accounts for three-quarters of the region's renewable electricity output and is increasing rapidly. China is driving the regional trend, though India, Pakistan, Turkey and Viet Nam have also increased hydropower production.

Variable renewable energy, in the form of solar photovoltaics and wind, is becoming mainstream in the power sector. In some locations, technology costs have fallen below the costs of new fossil fuel supply while technological advances, including battery storage, have supported wider integration. In 2017, variable renewable energy amounted to 4.9% of the region's total electricity output. This level has more than quadrupled from 2010 when the share was 1.1%. According to data from the International Energy Agency, Australia achieved the region's highest share of combined solar and wind energy in its national power mix at 8% in 2017, followed by Japan and Turkey at 7.7% and 7.3%, respectively. China has shown a dramatic increase of the share of solar and wind in total electricity output, growing from 1% in 2010 to more than 7% in 2018.

The Asia-Pacific region is at the global centre of renewable energy development and deployment, with a number of countries demonstrating leadership in investment, net capacity additions and production. The largest capacity additions in 2018 occurred in China, which added 45 GW of new renewable capacity, while India, Japan and the Republic of Korea added 10.8 GW, 6.5 GW and 2.0 GW, respectively. China led wind power installations, with 21.1 GW of new capacity, while India added 2.2 GW. Global hydropower commissions were dominated by China,

with 7.0 GW of new capacity in 2018, while Pakistan increased its total capacity by approximately one-third, with nearly 2.5 GW of new additions. Turkey and Indonesia led new geothermal capacity, adding 219 MW and 140 MW of new capacity, respectively. In 2018, solar photovoltaics dominated renewable energy capacity additions across the region.

In absolute terms, China leads both the region and the world in renewable energy investment and deployment. It produces more renewable electricity than the rest of the region combined and more than Europe, North America or Latin American and the Caribbean. China's total installed renewable energy capacity approached 728 GW by the end of 2018.

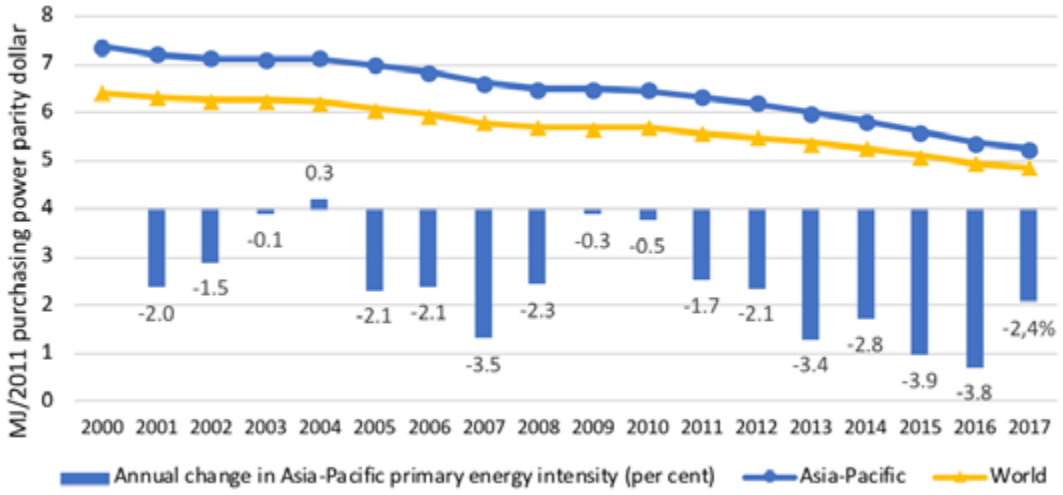
However, in 2018 investment in clean energy was down among the region's top investor countries. China led investment worldwide for the seventh successive year although it was down 37% from 2017's record level, largely in response to a mid-year change in the government's feed-in tariff policy for new solar power projects. Investment levels in Japan and India decreased by 16% and 21%, respectively. China was still the top regional and global investor at about US$ 100 billion, followed by Japan at about US$ 27 billion and India at about US$ 11 billion. India was the fastest-growing investor in the power sector, with investments in renewable sources outpacing fossil fuel investment for the third year in a row. Spending on new solar capacity in India exceeded expenditure on coal-fired generation for the first time in 2018.

Renewable energy targets have been established by nearly all Asia-Pacific countries, as well as at the regional and subnational levels. Some of the most ambitious targets are found among the Pacific Island States, several of which are targeting 100% renewable electricity generation. In South-East Asia, the members of the Association of Southeast Asian Nations (ASEAN) have set the aspirational target at the subregional level of increasing the share of renewable energy in the energy mix to 23% by 2025, under the ASEAN Plan of Action for Energy Cooperation 2016–2025.

Energy Efficiency

The Asia-Pacific region has demonstrated a long-term decline in the level of energy intensity of primary energy supply. The energy intensity level of primary energy dropped from 7.4 MJ/US$2011 PPP GDP in 2000 to 5.2 MJ in 2017 and is now approaching the global average of 4.9 MJ. The pace of energy intensity reduction has picked up in the recent period, with an annual reduction rate of 2.6% from 2010 to 2017 which is in line with the global annual reduction required until 2030 (Figure 3).

Figure 3. Primary energy intensity and annual change in Asia-Pacific, 2000–2017



In 2010, Asia and the Pacific had the highest regional energy intensity in the world. By 2017, the region had dropped to just below the level of North America to become the third most energy intense region in the world. While the region's GDP continues to grow, the primary energy supply has shown signs of levelling off in the recent period.

Energy consumption in Asia and the Pacific has increased rapidly since the early 2000s, in line with the region's economic development. Energy use in the industrial sector has grown, particularly in China, driving the sector's regional share of energy consumption above 40% in 2011. The subsequent fall in the sector's share can largely be attributed to energy ef-

ficiency measures implemented in China. Meanwhile, energy consumption in the region's residential sector remained relatively flat in the most recent period, whereas energy demand growth in transport is evident.

Electric and hydrogen vehicles have the potential to reduce energy consumption, local pollution and life cycle emissions for transport. In 2018, 1.1 million electric vehicles were sold in China, together with 26 million two- and three-wheelers. In Japan, there is a focus on expanding the production and use of hydrogen fuel cell vehicle technology.

Energy intensity declined in 36 countries, yielding negative compound annual growth rates for the period 2010–2017. However, during that same period, 13 countries had rising levels of intensity.

Regional cooperation plays an important role in improving energy efficiency in Asia and the Pacific. For example, in 2016, ASEAN members agreed to reduce their energy intensity by 20% in 2020 and by 30% in 2025, relative to 2005 levels. The subregion is set to exceed these targets. Backing this is the ASEAN Economic Community 2025 Consolidated Strategic Action Plan, a common framework for addressing matters such as regional and national policies and road maps for minimum energy performance standards, regional energy labels and standards, shared green building codes and data. These plans are supported by the ASEAN Energy Efficiency and Conservation Subsector Network.

Challenging coal dominance in the power sector in Asia-Pacific

The availability of modern and affordable energy has transformed the Asia-Pacific region, helping countries to develop their economies, and lifting millions out of poverty. However, the reliance on polluting and carbon intensive sources of energy such as coal has come at a great cost. The Asia-Pacific region accounts for almost 60% of global total CO2 emissions, nearly two-thirds of which are from energy sector, which is heavily reliant on fossil fuels. The Asia-Pacific region made up 80% of the world's coal consumption in 2018, with demand mainly concentrated in China (50%), followed by India (12%), Japan (3%), and South Korea (2.5%). South-East Asian countries jointly account for 4% of world's coal consumption. Almost two-thirds of the region's energy sector emissions come from coal-fired electricity generation.

The extent to which the region has ramped up the use of coal to meet its power needs is reflected by the average age of its coal-fired power stations, which is only 12 years. Given the typical economic lifetime of around 40 years, this infrastructure will lock high emissions into an energy system that needs urgent decarbonisation.

The UN Secretary-General António Guterres has recently declared that countries need to end their reliance on coal. He has called for taxes on carbon emissions, an end to the trillions of dollars worth of estimated subsidies for fossil fuels, and a stop to construction of coal-fired power stations by 2020, if we are to stand a chance of ending the climate crisis.
Despite the United Nations calling urgently for an end to coal-fired generation, hundreds of new coal-fired power plants in the Asia-Pacific are still being built, and hundreds more are in the pipeline. China and India have the largest number of coal-fired plants in the planning pipeline followed by the South-East Asian subregion. Among these countries, Indonesia, Viet Nam and the Philippines have the largest coal plant pipeline, with Malaysia and Thailand not far behind. The wealthier Asian countries are also bankrolling coal beyond their borders. Government-owned financial agencies in China, Japan, and South Korea are now the largest sources of funding for coal plants in other countries.

Nevertheless, the region is slowly moving in the right direction, and the number of coal-fired power plants currently being planned is falling. New permits for coal-fired power plants have dropped to record lows, and over a thousand have been cancelled, a reflection of a tougher economic climate for coal plant developers, and the growing consensus for the need to limit global warming, and to protect human health.

COVID-19 Crisis: challenges and opportunities for achieving SDG 7

The policy focus of many governments around the world has been diverted away from clean energy in response to COVID-19 crisis. Clean energy legislation, renewable energy reverse auctions and policy developments for clean energy have been sidelined in many countries due to the current crisis.

Demand for energy is down, boosting the renewable energy share in many countries. But a rebound eventually will happen and this temporary phenomenon will likely revert to the status quo.

Many large-scale renewable energy projects are being stalled by supply chain disruptions for components such as solar photovoltaic modules and wind turbines. While China is getting back to pre-crisis production, manufacturers in other parts of the world are now affected by lockdowns. This is expected to result in a reduction of installed capacity in renewables in many countries for 2020 compared to the previous year.

Low oil and gas prices may persist in the medium term, even as the pandemic recedes. The extent to which depressed prices will see oil and gas compete with renewable energy and remove incentives to pursue energy efficiency measures is less clear. Oil is not a significant part of power generation portfolios - it dropped from 8.3% in 2000 to 1.8% in 2017. The low prices are unlikely to impact long-term investments in utility scale generation but in the off-grid market could swing the balance away from solar to diesel-powered generation.

Renewable energy penetrations are becoming higher as electricity demand is reduced, while renewable energy output continues unabated. This is offering a glimpse of how power grids can manage higher renewable energy percentages in the future. This also provides a stress test of systems in real time to help grid managers prepare for integrating higher levels of renewable energy in the future.

While detailed scientific data on COVID-19 is only now emerging, it appears that exposure to poor air quality is a major risk factor for mortality from the virus. In this context, provision of clean cooking for rural populations takes on an extra importance to shield these populations from the worst effects of the virus.

When a vaccine is developed, energy, particularly for cooling, will be critical for the effective distribution of the vaccine to billions of people. WHO's requirement for vaccines is for storage at a temperature between 2 and 8 degrees Celsius. Up to 80% of a vaccine's delivered cost is related to keeping it cold. Therefore, sustainable energy best practices for vaccine storage and transportation are essential to ensure that COVID-19 and other vaccines do not become prohibitively costly for vulnerable communities.

After the pandemic there may be a return to business as usual. There are positive lessons from COVID-19 that can contribute to SDG 7, such as making more use of technologies for remote working and learning to reduce congestion, energy demand and air pollution. These need to be considered by policymakers in managing the transition back after the COVID-19 crisis. Government stimulus packages should aim to accelerate decarbonisation and greening of the economy, including the use of renewable energy, energy storage and electric vehicles.

PRIORITY AREAS FOR ACCELERATED ACTION: POLICY IMPLICATIONS AND RECOMMENDATIONS

Achieving universal access to electricity in the Asia-Pacific region will require governments to maintain their commitments to sustain the current increase rates.

The disparity between access to electricity in urban versus rural areas remains, but the gap is being closed with advances in off-grid and mini-grid technologies. A continued focus on access for rural populations is needed, with emphasis on providing off-grid areas with energy services that go beyond subsistence levels of energy consumption and strive towards greater quality and quantity of supply to support modern lifestyles and productive activities.

Off-grid renewable energy technologies represent a viable electrification solution, although in some cases insufficient or inappropriate regulation of the off-grid energy sector creates challenges. Within a single country, various technological solutions, ownership

frameworks and business models may create barriers to assuring that modern energy services are reliable. Efforts are needed to develop dedicated policies and regulations designed for various off-grid solutions. Financing gaps should be addressed to encourage more private sector participation. Global and regional financial institutions can play a significant role in developing public and private financial and insurance mechanisms and complementing national efforts.

Tracking electrification progress has a number of data-related challenges. No single internationally accepted and internationally adopted definition of modern energy access exists. What constitutes 'access to electricity' in one jurisdiction may not be accepted in another. In addition, the current indicator used for tracking electrification is binary: a household either has or does not have electricity. That measure does not account for other aspects of energy access, such as quantity, reliability or affordability, which are important in helping to understand electricity's usability and potential with regard to socioeconomic impact. Furthermore, the quantity and quality of data in many national contexts are insufficient, for off-grid areas in particular, due to such issues as methodological inconsistencies and irregular or infrequent data collection.

Clean cooking targets must be integrated into national energy plans. In general, investments in the area of clean cooking are minuscule in comparison to what is needed to achieve universal access to clean cooking. Additional resources are needed to support the development of options that meet consumer needs and overcome barriers, such as cost and cultural preferences. Furthermore, increasing employment opportunities for women in rural areas raises the opportunity cost of gathering fuel for cooking. With value attributed to women's time, households are more likely to choose more efficient technologies with shorter cooking times and reduced fuel gathering requirements. Policies in support of clean cooking fuels and technologies also help to raise awareness about the negative impact of traditional cooking technologies and fuels on human health.

Affordability remains a barrier. Clean cooking solutions are often more expensive than conventional options. Even if the costs over time may be lower, lump-sum payment requirements for options such as liquefied petroleum gas can present a hurdle for consumers with variable cash flows. Efforts to lower the cost of clean cooking solutions through subsidies have encountered challenges in a number of cases. Subsidised products do not always reach the intended beneficiaries, and in some examples, subsidies have provided greater advantages to the wealthy than to the poor. Smart policy solutions are needed to lower the economic threshold for new clean cooking consumers, while also limiting government spending on subsidies.

Liquefied petroleum gas is emerging as the preferred clean cooking option, due to its proven utility, portability and health advantages. Electric cooking options also eliminate smoke, but may be expensive, and have high power demand; they are also often used as a supplement to other cooking methods in 'fuel stacking' (for example, an electric rice cooker may be used in combination with fuelwood to cook main dishes). Improved cookstoves remain an important option in many contexts, though their performance and health benefits can be difficult to verify and certify. The adoption of modern technologies supports more efficient clean cooking markets. For example, in a number of locations across the region, liquefied petroleum gas can be ordered for home delivery by using a mobile application or a text message.

Data for tracking progress in clean cooking are primarily sourced from household surveys that are not completed at regular or frequent intervals. Better data collection is needed to identify high impact measures and market opportunities while also supporting the tracking of progress towards universal access.

Renewable energy development represents only approximately one-fifth of the region's energy consumption and it has been highly concentrated in the power sector. More attention is needed to increase the use of renewables in other sectors, in particular transport and heating. In the Asia-Pacific region, 70% of renewable energy is consumed for the purpose of heating, the bulk of which is done with traditional biomass. Efforts should also be made to support the shift from traditional biomass to more advanced and efficient renewable energy technologies. In addition, while 19% of the energy consumed in the region is used for transport, only 2% of overall renewable energy use is in this sector.

Cross-border power grid connectivity has the poten-

tial to match unevenly distributed renewable energy supplies with demand centres throughout the region, and to create wider balancing areas capable of handling higher shares of variable renewable energy with enhanced stability. A number of regional initiatives include plans for multilateral market integration, though progress has been slow and multilateral trade has yet to be initiated in most areas of the region. Strengthened cooperation is needed to harmonise technical, legal and regulatory frameworks and to reach consensus on how to calculate the sharing of market integration benefits.

While generation technology has become increasingly affordable and accessible, grid capacity is a main limiting factor in some contexts. Investment levels in power infrastructure are insufficient. The Asian Development Bank estimates that the region requires US$ 11.7 trillion in baseline investment in the power sector for the period 2016–2030, or an average of US$ 779 billion per year. Climate-adjusted estimates are higher, totalling US$ 14.7 trillion, or US$ 982 billion per year. The annual gap in investment is estimated to be between US$ 330 billion and US$ 459 billion.

Better data on renewables are needed. Biomass is the most-consumed renewable energy resource in the region, but information on this resource is scarce and of poor quality. In addition, statistics do not distinguish between sustainable and unsustainable biomass production, which creates challenges for measuring progress on SDG 7. Furthermore, data for off-grid energy are limited and not sufficiently captured in energy statistics. Efforts are needed to develop improved standardised methodologies and more complete national data sets.

Energy efficiency targets have been established in many Asia-Pacific countries, which are increasingly adopting action plans and measures to lower rates of energy consumption across the industrial, commercial, building and transport sectors. Targets are highly variable in their structure and ambition but are generally formulated with a view to lowering energy or electricity intensity or reducing overall energy consumption. Factors driving the adoption of these measures include the need to meet domestic demand for adequate and reliable energy supplies, together with support for economic growth and emission reductions.

Upgrades to and replacements of, power generation, transmission and distribution infrastructure are improving the energy sector's performance, which is important in the face of growing demand for electricity. Efforts such as the conversion of single-cycle power plants to combined-cycle generation, and the upgrade of power grids to reduce losses, which is a priority for many countries, have the potential to increase the power supply and reduce the need for additional generation capacity. Greater support is needed to comprehensively assess existing energy systems with a view to identifying the best options for long-term improvements in energy efficiency.

The adoption of common energy efficiency standards and labelling systems supports the reduction of energy consumption, while also building regional and global energy efficiency markets. National and subnational emissions trading schemes can play a significant role in encouraging energy efficiency.

To advance energy efficiency, more ambitious and specific targets and plans are required at the economy-wide and sectoral levels. Roadmaps are needed to phase out inefficient technologies and adopt emerging technologies, including smart grids, advanced building systems, efficient transport and the latest industrial and appliance technologies.

Financing for energy efficiency is a significant barrier for many countries. Increased knowledge-sharing and cooperation are needed to address a lack of funds and expertise for developing financing mechanisms.

Despite the evident progress in reducing energy intensity, many factors aside from efficiency measures have led to this outcome, and progress is needed to improve policy structures. In some cases, economy-wide targets do not exist or are set out within broad policy documents without supportive actions backing them. Policy frameworks for energy efficiency are weak in the Asia-Pacific region compared to those for energy access and renewable energy. As countries move towards defining targets in regulatory documents, with explicit measures and instruments to meet them, energy intensity reduction can be expected to accelerate across the region.

Governments in Asia will need to reverse their current trend of expanding coal-fired generation capacity and

instead urgently implement policies to enable a quick decarbonisation of the electricity mix. Strengthening governments' commitments to climate policy with Nationally Determined Contributions that include a clear commitment to phasing out coal, removing subsidies for fossil fuels, and building support for renewables and energy efficiency will offer new opportunities for both developed and developing countries in the region to build a low-carbon economy, with significant benefits for sustainable development.

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POLICY BRIEF VII.

ADVANCING SDG 7 IN THE ARAB REGION

Contributing organisations:

UN Economic and Social Commission for Western Asia (ESCWA) in collaboration with the IEA, WB, WHO, UNSD and IsDB

KEY MESSAGES

Progress towards achieving SDG 7

Achieving SDG 7 in the Arab region requires significantly scaled-up progress in renewable energy, and in decoupling regional growth from energy consumption through improved energy efficiency, and increasing productivity of energy use while protecting the climate and ensuring a healthy planet for future generations. , which constitute one of the most fundamental challenges across all Arab countries in the coming decades. Conflict and instability have added additional further long-term challenges to progress in SDG 7 in a number of Arab countries in recent years.

In addition, the COVID-19 crisis is an eye opener regarding the multifaceted vulnerabilities of the Arab region associated with the sustainability of their energy systems and their ability to support socioeconomic growth and development in an even challenging and uncertain environment. COVID-19 touches each of the energy supply chains at a moment when the Arab region energy transition was beginning to build steam. Indeed, low oil and gas prices may place pressure on the economics of renewable energy sources and could limit the capital available for industries and related projects without policy support.

Access to energy

Access to energy is one of the brightest spots in the Arab region's sustainable development agenda. The Arab region's electrification rate rose from 88.4% percent in 2010 to 92.5% percent in 2018, making it the most electrified regional group of countries in the developing world. Overall, access to electricity is close to universal in cities across the Arab region but stood at only 84% per cent in rural areas in 2018. However, unplanned service disruptions, continue to be a challenge for all electricity users, irrespective of the urban/–rural or income level divisions.

Access to clean cooking fuels and technologies CFTs remained high in the Arab region with 12 countries having almost full access in 2018. , whereas, the Arab Least Developed Countries (LDCs) accounted for most of the access deficit in the region's for clean fuels access deficit, as well as that of the electricity.

Efficiency

The Arab region is not on track with global energy efficiency targets. While globally the region has the second lowest regional energy intensity rate in global comparison, this decline is not enough to help the region maximise the productive use of its energy resources. Agriculture and services have seen the deepest reduction fall in energy intensity in the Arab region since 2010, while the transport sector remains the highest energy intensive of the world's regions.

Renewables

Renewable energy continues to be used far below its potential in the Arab region. As of 2017, renewable energy accounted for almost 11% percent of the Arab region's energy mix, the lowest share in any of the world's regions. Only a handful of countries account for virtually all of the region's renewable energy consumption leaving substantial scope for further uptake, given the region's plentiful renewable energy resources.

Priority actions over the next four years

• Re-prioritise structural economic diversification, & boost energy productivity and redirect energy subsidies to mobilize sustainable energy technologies and scale -up investments on socioeconomic development, especially in the health sector.

• Establish sustainable Demand and supply-side management systems and implement large-scale energy efficiency retrofit programmes across all economic sectors.

• Opening up of market opportunities and the removal of barriers in order to increase private sector involvement and develop local manufacturing of clean energy technologies components.

• Strengthening information quality, data sharing, monitoring and reporting, and awareness-creation, and reinforce the role of civil society, gender equality and stakeholder engagement.

Towards 2030

• Integrate sustainable energy action plans into development strategies with clear SDG targets, and ensure long- term commitment.

• Make necessary policy and regulatory reforms for integrating energy, climate and environmental goals more closely into socioeconomic development targets, and for developing the required implementation mechanisms.

• Ensure that health facility energy needs are appropriately articulated in the context of national energy plans and strategies, in particular those aimed at addressing critical industries and end users of energy services.

• Enhance interregional cooperation, including through trade and grid interconnection, and share and learn from best practices.

• Build institutional capacity, transparency and accountability, and strengthen local governance and communication.

PROGRESS TOWARDS ACHIEVING SDG 7

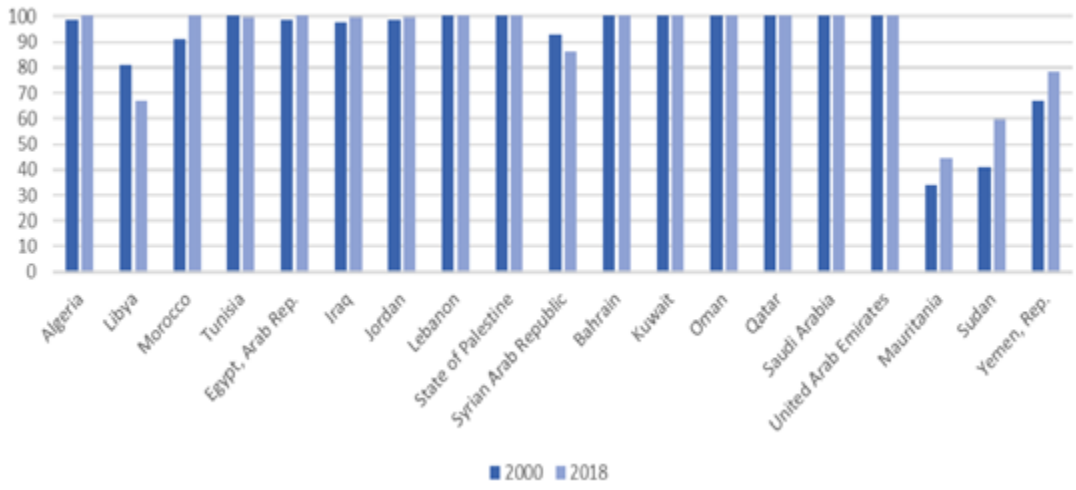
Energy Access

Electrification Access to electricity is to a large degree a bright spot in the Arab region's sustainable development agenda. By 2018, electrification access was universal in all but three Arab countries[1], with a history of near-complete electrification rates in the Gulf Cooperation Council (GCC) countries and parts of the Maghreb and Mashreq reaching back well into the 1990s. Encouragingly, the region's electricity access deficit has been reduced from about 40 million people in 2010 to roughly 30 million in 2018.

Key deficit countries. Despite near universal access to energy in most of the countries in the Arab region, the Arab LDCs continue to face the challenge of large portions of their rural populations lacking even basic electricity, which has far-reaching effects on sustainable development.

Share of population with electricity access in the Arab region, 2000 and 2018 (%)

Source: World Bank (2020)



Over 90% of the Arab region's entire electricity access deficit in 2018 remained concentrated in the three Arab LDCs: the Sudan (16.8 million), Yemen (6.1 million) and Mauritania (2.4 million).

Urban–rural distribution. The Arab region's remaining electricity access deficit is predominantly a rural problem. Some 88% of the Arab LDCs' urban populations had access to electricity in 2018, but only around 53% percent of its rural populations. The rest of the region's access deficit is found in Libya and the Syrian Arab Republic, both conflict-torn countries, with Libya not recovering its 100% access rate after 2000.

Conflict, occupation and instability have led to a regression in access. In Iraq, Libya, the Syrian Arab Republic, Yemen and the occupied Palestinian territory (specifically Gaza), there has been damage to, and destruction of, national infrastructure, including power-generation plants and transmission infrastructure. This has contributed to the collapse of essential public services such as health care, schools, secure water access and sewerage. Libya and the Syrian Arab Republic saw declining rates of electricity access over the tracking period, reflecting large-scale destruction of infrastructure that will likely challenge the countries' efforts in providing universal access to electricity to citizens for many more years to come.

Electricity reliability. Electricity service disruptions are a problem for households, as well as for businesses, medical facilities and the public sector, all of which rely on functioning electricity services. Planned and unplanned service disruptions due to insufficient generation capacity and transmission infrastructure have been of particular concern in conflict-affected countries, Iraq, Libya, the State of Palestine, the Syrian Arab Republic and Yemen, and have also affected neighboring Jordan, and Lebanon.

The COVID19 crisis put pressure on electricity and water availability. This crisis demonstrates the cen-

1 The Arab region here includes North Africa (Algeria, Morocco, Libya, Tunisia) Mashreq (Egypt, Iraq, Jordan, Lebanon, Palestine, Syria), GCC (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates), LDC (Mauritania, Sudan and Yemen).

tral role and importance of electricity, and what policy makers need to do in order to ensure that current and future systems remain reliable, especially for water supplies and health facilities. The Jordanian water sector accounts for approximately 15% of the total annual electricity generated. In Qatar, the United Arab Emirates and Bahrain almost 30% of fuel consumed during power and water generation is due to desalination.

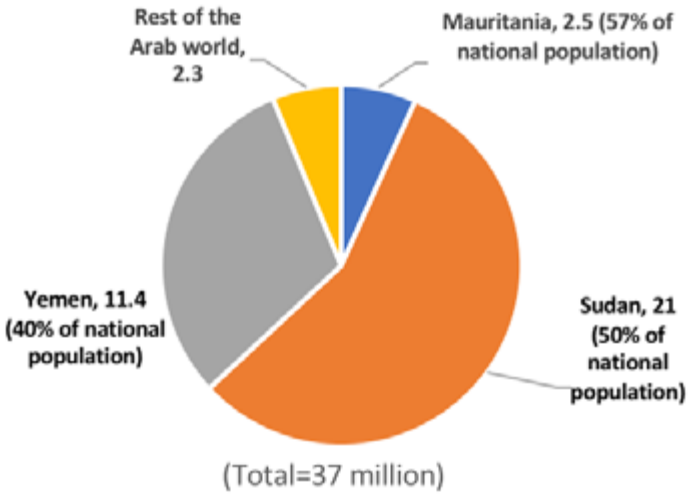
Special support is needed for Arab LDCs and countries in conflict to resolve the energy gap in health facilities, which requires that decision makers from the energy and health sectors work more closely to ensure that health facility energy needs are adequately prioritised. In the absence of electricity, many basic life-saving interventions in health facilities, including those needed to combat the spread of COVID-19, cannot be performed safely or at all. Many negative consequences particularly affect women in Yemen, including a dramatic worsening in medical services due to lack of health clinics' inability to refrigerate vaccines and provide other life-saving services.

Affordability is linked to service quality and the rate of access. Electricity is not equally affordable everywhere. Jordanians, Moroccans, Palestinians and Tunisians pay on average more than 20 times the average bill in the Arab region's lowest-cost country. This affects affordability of electricity services in these countries, particularly among low- and lower-middle income groups. Many off-grid solutions such as mini-grids that offer access to remote settlements similarly remain disproportionately expensive, affecting access rates.

Clean Cooking

Overall, access to CFTs is encouragingly high in the Arab region, but it still lags behind progress made in the area of electrification. Region-wide access to CFTs has grown at an average annual rate of 0.22% since 2010, driven primarily by improvements in access rates in Mauritania and the Sudan, which account for a large share of the region's access deficit.

The Arab region's clean cooking access-deficit in population numbers, 2018



Source: World Health Organization, 2020.

Urban-rural divide. As in the case of electricity, the access deficit for CFTs is far more pronounced in rural areas than in cities. Access to finance is a critical enabler of universal access to CFTs and considerably more dedicated efforts to target CFTs are required than has been the case in the past.

Political conflict has contributed to slower progress on access to CFTs. Parallel to the breakdown in electricity services, a number of conflict-affected countries have experienced deterioration of CFT access, leading to severe health consequences and environmental destruction as parts of the region move backwards on the energy ladder.

While people around the world are staying at home in an attempt to curb the spread of COVID-19, women may have increased household responsibilities, including more demand for cooking. Where women are being constantly exposed to smoky cooking conditions, there is a need for better availability and affordability of suitable, non-polluting, household energy solutions. In precarious security situations, when families are confined to their homes women may also be more at risk for gender-based violence.

During the current confinement situation in an attempt to curb the spread of COVID19, women will suffer the most as they are responsible for cooking.

There is therefore an urgent need to improve the availability and affordability of suitable household energy solutions that are clean for health at the point-of-use. An increasingly precarious security situation exacerbated during the current pandemic crisis is also raising the risks of gender-based violence.

Energy Efficiency

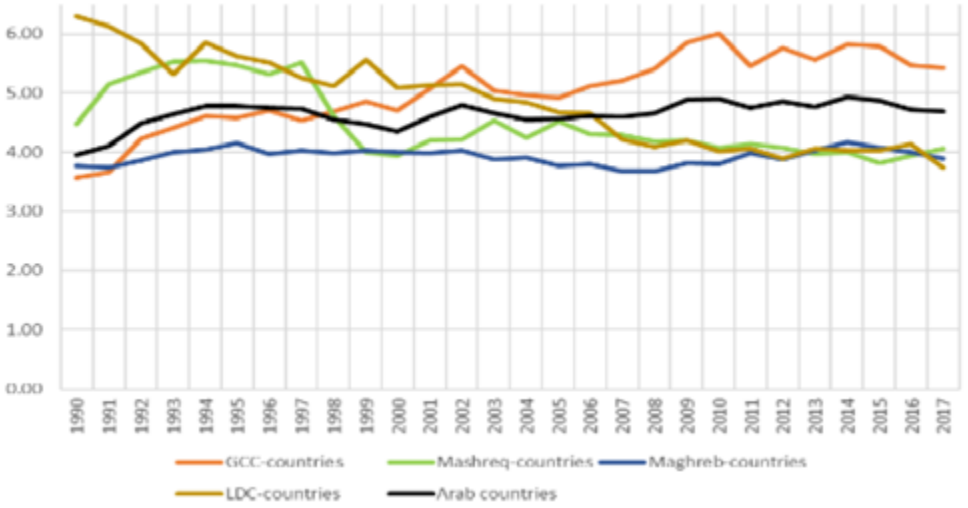
The Arab region's average energy intensity rates remained almost unchanged at around 4.7 MJ/US$2011 PPP in 2017, continuing a long-term flat trend of autonomous and largely structural energy efficiency improvement since 1990. The Arab region energy intensity progress rate has improved over the past four years. Changes from2014 to 2017 at the country level show new progress, with some countries seeing results from previous energy efficiency plans. The Maghreb (without Libya), the Mashreq, and Arab LDCs have seen a long-term trend in falling energy intensity since the 1990s.

Conflict and instability have significantly affected concerned countries' energy intensity rates, in particular Iraq, Libya, the State of Palestine and the Syrian Arab Republic.

The GCC exhibits different dynamics than the rest; overall energy intensity in the GCC has been rising since the 1990s, albeit with a gradual decline in more recent years, to around 5.4 MJ/US$ 2011 PPP in 2017. Bahrain and Qatar's energy intensity is far above the rest of the GCC, though with a downward trend.

Arab subregion energy intensity trends from 1990–2017 (MJ/2011 PPP US$)

Source: IEA, 2019.



Transport energy intensity is the highest of the world's regions, and there is significant scope for improvement. Public transportation has only recently been developed in parts of the region, but a range of sustainable public transport projects are being implemented and will improve mobility and sustainability of travel in many countries in the region. Rationalising energy use in the transport sector is a key challenge. For years the environmental community has called on employers in the public and private sectors to accelerate telecommuting plans, reduce international travel, and decouple energy consumption from economic growth. However, little has been done on the scale required, especially in the Arab region, which is still the most energy intensive. Among the lessons learned from the current health crisis is the urgent need to accelerate progress towards sustainable energy systems.

Special policy attention needs to be given to energy intensive industries (which represent more than 70% of industry's energy consumption in many countries in the region), particularly large-scale energy extraction and processing activities.

Oil and gas exports dominate industrial activity in the Arab region's large oil exporters—Algeria, Bahrain, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia and United Arab Emirates—making up more than 50% of industrial value added. Industrial structures shifted as fuel export values dropped, including when oil prices

fell in 2014, and as processed metal and manufacturing grew after 2010.

Agriculture forms an important part of the economies of a number of Arab countries, in particular Egypt, Jordan, Lebanon, Mauritania, Morocco, the Sudan and Tunisia. The sector's performance is already challenged by changing weather patterns affecting productivity and energy intensity, with increasing demand for irrigation and mechanical ventilation of facilities for livestock. Climate change will likely accelerate these challenges over the coming decade.

Accelerating energy intensity improvements will be a priority for agricultural producers in already vulnerable region in terms of food security and water scarcity. Due to the COVID-19 pandemic, there is likely to be greater demand for water and food production, driven by restrictions on food exports and the need to ensure self-sufficiency during the crisis.

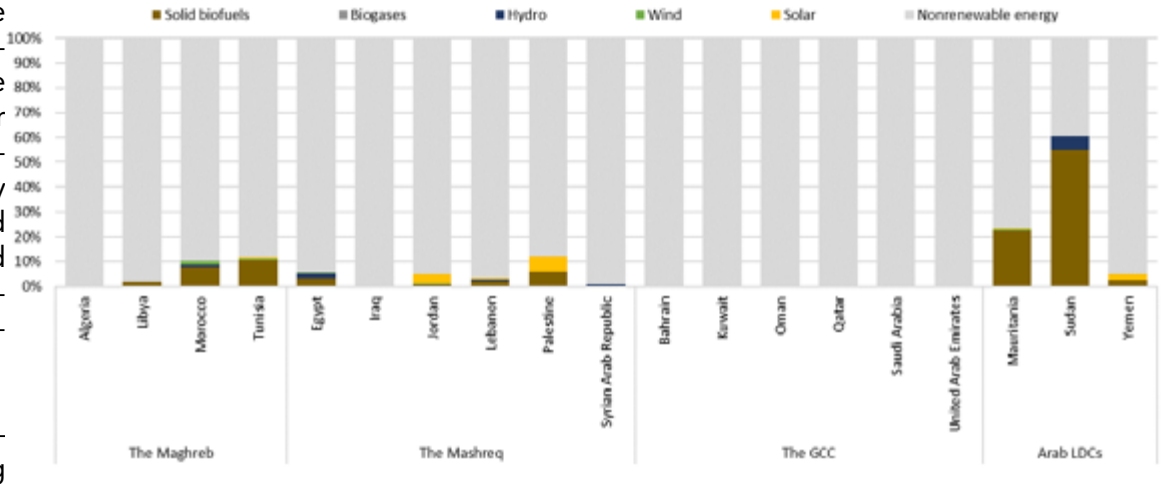
Building energy intensity is growing in the Arab region. Factors driving up building demands for energy include: rising living standards and incomes, with home appliances becoming affordable to larger segments of the population; climatic factors that include hotter weather across the region; and buildings that were/are built, in most cases, using designs and materials that are not the most appropriate to meet these challenges.

Renewable Energy

The share of renewable energy has been around 10% of the Arab region's total final energy consumption since 2010, reaching 10.8% in 2017. Very few Arab countries rely on renewable energy for a substantial share of their final energy consumption. Only in Mauritania, Morocco, the State of Palestine, the Sudan and Tunisia does renewable energy contribute a substantial share—above 10% —to the national energy mix. Then it is mostly due to the widespread use of solid biofuels, which in many cases provide inferior access to energy compared with modern liquid and renewable energy sources and electricity. Nine Arab countries, including all GCC countries, consumed no or only negligible amounts of renewables, basing their energy mix virtually entirely on fossil fuels.

Solid biofuels continue to account for the largest share of renewable energy consumed in the Arab region—around 81% of total renewable energy consumption. Much of the Arab region's solid biofuel use is traditional, largely for use in cooking, heating and some lighting, with low levels of efficiency and high levels of associated indoor air pollution.

Share of individual RE sources in total final energy consumption, by Arab region country, 2017



Source: International Energy Agency, 2019

With around 13% of total renewable energy consumption, hydropower remains the next most important renewable energy source (after solid biofuels) in countries with hydro-resources, particularly in Egypt, Iraq, the Sudan and the Syrian Arab Republic. Only in Morocco is wind energy more important today than hydropower.

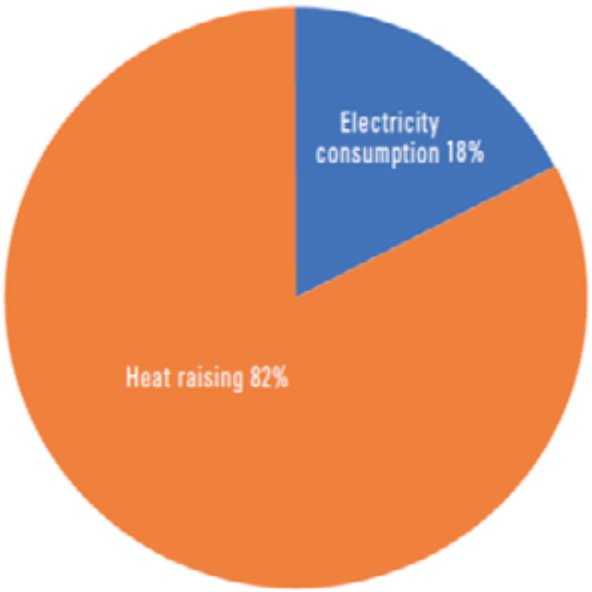
Solar and wind energy have increased in use in recent years, with the highest shares in total final energy consumption in Jordan, the State of Palestine and Yemen. Iraq, too, has seen an uptake of solar energy, but has had limited capacity for data collection over the tracking period.

Significant cost reductions for solar power utility-size projects and deployment of wind power in Arab countries have been driven by effective policies designed to remove market barriers and encourage

private investment. This includes a positive investment climate for utility-scale solutions and attractive financing rates, such as in the GCC.

The dominant use of renewable energy is for heating. Owing to the high share of solid biofuel for use in cooking and heating in the Arab region, the residential sector remains the most dominant end-user of renewable energy. In 2016, it accounted for over 80% of total renewable energy consumption, owing to the large proportion of solid biofuel used for cooking. Only 18% of the Arab region's renewable energy consumption is accounted for by electricity generation, with virtually no use of renewable energy in the transport sector.

Final consumption of renewable energy by end-use sector, 2016



Source: Authors' calculations based on International Energy Agency, 2018; United Nations Statistics Division (2018).

The Arab region is highly vulnerable to future effects of climate change and is not on track to meet its targets under SDG 13. This threatens the livelihoods of millions by impacting the availability of arable land, drinking water (through increased heat), and the more frequent occurrence of natural disasters. Climate action needs to become an integral part of national policymaking, and regional economies have a lot to gain from aligning policies with the SDG framework and national energy plans. NDCs need to be better associated with SDG 7 and SDG 13, and finance for conventional energy systems needs to be re-directed to mobilise sustainable energy technologies.

POLICY IMPLICATIONS & RECOMMENDATIONS

Formulate appropriate policies and create a wider business-friendly environment in which markets, rather than government-directed projects drive structural change. This requires the right mix within each national context of positive incentives, and effective enforceable regulation, to drive widespread implementation and outcomes in renewable energy and energy efficiency.

Integrate sustainable energy programmes with wider socioeconomic policies, such as addressing income poverty and supporting access to health and to credit facilities and develop implementation capacity critical to the success of these policies. Governments need to consider the current and projected declining price trends for renewable energy and energy efficiency technologies, as there are opportunities to displace consumer energy subsidies with lower-cost and higher-quality services.

Make finance available for rapidly expanding implementation. Existing investments in energy efficiency and renewable energy are only a small portion of existing capital flows. There is now sufficient experience in energy efficiency and renewable energy technologies in the Arab region to rapidly expand investment in their implementation. Existing efforts at establishing super-ESCOs in the region demonstrate how to scale up sustainable energy investment.

Promote increased health-sector reliance on clean energy, promote energy efficiency, and ensure that appropriate resources and responsibilities are allocat-

ed to the management (and maintenance) of health facility energy resources. The current COVID19 crisis has shown the need to increase investments in the health sector, which could be expanded by reallocating fossil fuels subsidies to the health sector.

Enhance regional and international cooperation in ensuring the resilience of energy systems through free trade, energy interconnectivity, research and technology transfer, and mobilisation of funds to support developing and vulnerable communities to jointly face any global, regional and national disasters, such as the COVID-19 pandemic, and the long-term global threat of climate crisis.

Support credible institutions and effective mechanisms for monitoring and enforcement. Institutions must be given the mandate to carry out their work effectively, be staffed by appropriately trained and paid professionals, and make it an integral part of their work to encourage and collect citizens' feedback on how policies affect people, businesses and ultimately the success of their underlying objectives. Strong institutions benefit from increased government focus on transparency and accountability, which are aspects of good governance practice that deserve much greater focus in the Arab region.

Change consumption behaviour. By improving consumer information, through more transparent data and information management, and reforming national utility sectors that obstruct private user incentives, governments can implement comparably inexpensive but potentially effective ways of changing energy consumption patterns and driving the diversification of the national energy mix. Private sector markets are also important for driving energy efficiency improvements and technology deployment. Examples of substantial business and private sector outcomes in sustainable energy often contrast with poor outcomes and evaluation by governments. This highlights the important role of governments as regulators and credit facilitators, rather than necessarily as central planners, providers and deployers of technology.

Promote knowledge creation, informed citizens, and effective public debate. Informed, lively and critical national debate, based on access to information by all citizens, is critical to achieving progress across development indicators, including in energy. Lack of effective public debate, good quality information and credible media constrains governments' ability to mobilise and engage citizens, businesses and industries in better practices, and contributes to the persistence of ineffective policy frameworks. Societies need to be able to evaluate whether current policies are working, and whether they address root problems, such as income poverty and access to health care in the case of access to modern energy, or affordability in the case of more energy efficient appliances.

Build policies on consultation, engagement and collaboration. Achieving SDG goals is a challenge for everybody in society, not just a task for governments to carry out alone. Implementation can be best advanced through stakeholder engagement by drawing in and enabling business and household decision-makers, plus social, religious and environmental interest groups, in a "grassroots" engagement in shaping a more sustainable and just future. Children will be the ones to experience the long-term benefits of the SDGs, and have a special role in shaping how policies advance SDG ambitions. Governments can empower this vast resource of citizens by engaging with them in consultation on SDG policies, enabling self-help community-level programmes, and developing collaborative activities to advance renewable energy and energy efficiency in communities.

Review outcomes to develop effective policies and implementation. Aggregate trends in energy offer little insight into the effectiveness of policies or the diverse outcomes that are produced by energy efficiency and renewable energy. Policy and programme developers need to actively track policy and programme impacts, to engage society in the changes that need to be made, redesign policies to work better, and learn how to accelerate implementation.

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POLICY BRIEF

ACHIEVING ACCESS TO CLEAN AND AFFORDABLE ENERGY IN THE UNECE REGION

Contributing organisations:

UN Economic Commission for Europe (UNECE)

KEY MESSAGES

Technology changes, along with accelerated decarbonisation, will be crucial to keeping a global temperature rise well below 2 °C above pre-industrial levels and pursuing efforts even further to 1.5 °C objective and attaining the objectives of the 2030 Agenda for Sustainable Development.

Even under a climate change scenario that meets the 2oC target while delivering on the 2030 Agenda, fossil fuels would still account for 56% of the regional energy mix in 2050. Alternative energy technologies either are more costly or cannot be deployed within that timeframe, so achieving carbon neutrality, through deployment of lower-carbon fossil fuels, nuclear power, hydropower, and carbon capture and storage, will be an important interim objective.

In terms of investments, the difference between a reference scenario and one that achieves a 2oC target is estimated at US$ 6 trillion, or US$ 200 billion annually. Spread over all economies and over the indicated timeframe, this sum is considered manageable compared to savings in costs of climate change in terms of, for example, health, famine, property losses, and biodiversity.

In many countries across the region energy poverty needs to be tackled, yet a badly managed energy transition could exacerbate the challenge. The elderly population is vulnerable, as energy bills can equal 30% of their monthly pensions, in part due to poorly built or maintained buildings. Countries with tighter building regulations and higher GDP per capita have lower levels of energy poverty.

Delivering the 2030 Agenda requires accelerated improvements in energy efficiency – notably improving the overall performance of buildings. The productivity of industry is also central to meeting the sustainability challenge. Commercialisation of new technology is expected to drive decarbonisation of the transport sector, and urban mobility can be addressed with proper planning of city infrastructure and transport efficiency.

Despite the overall increase in renewable energy capacity and its increasing share of energy supply in the region, in some subregions the potential of renewable energy remains untapped. More effective institutional investment and transaction frameworks are needed.

The policy imperatives for achieving the 2030 Agenda are clear:

1. Pursue systemic efficiencies – improved energy productivity should be at the core of future energy systems.

2. Cut 90 Gt of CO2 emissions by 2050. Commitments can only be achieved with reduced and negative carbon emission technology to bridge the gap until innovative, next generation low, zero, or negative carbon emission technology is available and can be deployed widely.

3. Optimise existing fossil-based infrastructure and integrate renewable energy-based technology, while mitigating the negative socioeconomic implications of reducing fossil fuel use.

4. Accelerate deep transformation of the energy sector. Place a price on carbon; commercialise decarbonised gases; establish regulatory frameworks for big data, smart grids and an integrated systems approach; deploy information and communication technology; and design energy markets to promote innovative, sustainable and flexible business models.

5. Advocate efficient integration of energy markets, rather than energy independence, to ensure energy security, facilitate cross-border cooperation, and introduce and scale up low-carbon technology.

6. Promote sustainable resource management that embraces circular economy principles and the full spectrum of the 2030 Agenda's goals and targets.

The UNECE region is diverse, and national energy strategies reflect varying national priorities, including economic growth, environmental and climate concerns, energy access, energy security, and resource efficiency. Fossil fuels underpin the quality of life across the region. Technology changes and accelerated decarbonisation will be crucial to keeping a global temperature rise well below 2 °C above pre-industrial levels and pursuing efforts even further to 1.5 °C objective and attaining the objectives of the 2030 Agenda for Sustainable Development.

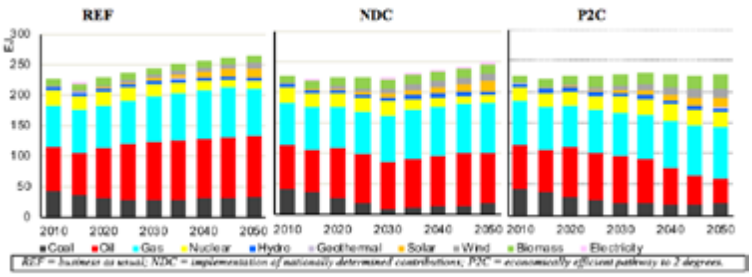
The energy transition challenge is significant, as the share of fossil fuels in primary energy supply is 80%. The region's 56 countries represent 39% of world primary energy consumption and produce 41% of world GDP. The region produces 40% of the world's primary energy resources and emits 39% of global CO2 from fossil fuel combustion.

Many countries and people depend on fossil energy for their incomes and livelihoods. They cannot be expected to abandon their quality of life ambitions. However, the world is on a path to global average temperatures that are 4-6oC above pre-industrial levels, temperature levels that are considered a catastrophic, existential threat. There is a critically urgent imperative to find a sustainable balance among competing interests. For the region, promoting mutually beneficial economic interdependence would accelerate attainment of sustainable energy.

Energy scenarios 2020 – 2050

Access to electricity and reliance on clean fuels and technology are key indicators for achievement of SDG 7. The UNECE has assessed a range of different future energy mix scenarios (see Figure 1). Even under a scenario that meets the 2oC climate change target while delivering on the 2030 Agenda, energy from fossil fuels (coal, oil and gas) would still account for 56% of the regional energy mix in 2050. Some alternative energy technologies would be too costly or could not be deployed within the required time-frame. Although renewable energy might be competitive for electricity generation in some markets, deploying renewables in the transport sector would remain a challenge.

Figure 1 - Primary Energy Demand in the UNECE Region by Policy Scenario



Source: UNECE (2020), Pathways to Sustainable Energy: Accelerating Energy Transition in the UNECE Region

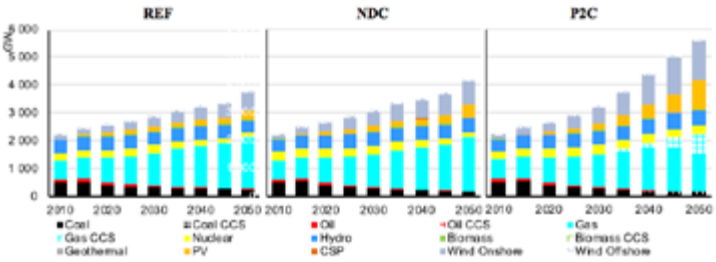
In the reference scenario (REF), the evolution of the capacity mix would be determined by electricity demand growth, technology costs and fuel prices, socio-political preferences and economic risk perception. Natural gas generating systems would be the technology of choice in this scenario because of competitive fuel prices, flexibility characteristics and lower investment costs compared to other thermal generating technologies. Consequently, gas-fired capacity would penetrate all market segments from peak to baseload supplies. Though serving peak demand has been a traditional market for natural gas, growing intermittent renewable generation gives natural gas a crucial balancing role and, in many regions, natural gas would progressively substitute for coal, oil and nuclear capacity in the baseload market.

In the nationally-determined contributions scenario (NDC), the generating capacity mix differs only marginally from the REF scenario. Until 2030, coal and oil generation would be constrained by greenhouse gas emissions limits and replaced by a varied portfolio of low carbon technology including natural gas, nuclear, hydro, solar photovoltaic and wind. From 2030 on, NDC emissions reductions would lead to further substitutions for coal and oil, and also replacement of natural gas from 2030 to 2040 by non-fossil capacities. Intermittent generation from renewable energy would provide 25% of total generation by 2050, causing a 'rebound' of gas capacity and generation after

2040 to provide load balancing. By 2050, although coal generating capacities would be 27% lower than in the REF scenario, 200 GW of relatively new coal-fired capacity would still be operational. Coal plants equipped with carbon capture and storage (CCS) would emerge in the market after 2040.

In the pathway to 2oC scenario (P2C), by 2050 renewable energy would account for 55% (3,050 GW) of total installed capacity. This increase represents replacement of fossil capacity driven by imposed global GHG emission budgets and adjustments in the final energy mix (with greater shares of electricity and, to a minor extent, hydrogen). While coal capacity would remain part of the mix, operating plants would be equipped with CCS. All new natural gas capacity built after 2030 would be equipped with CCS and existing plants would be retrofitted progressively. Nuclear power and hydroelectric capacities would also make a contribution. Nuclear power capacities would double in the P2C scenario compared with the REF scenario.

Figure 2 - Electricity Generation Capacity in the UNECE Region by Policy Scenario

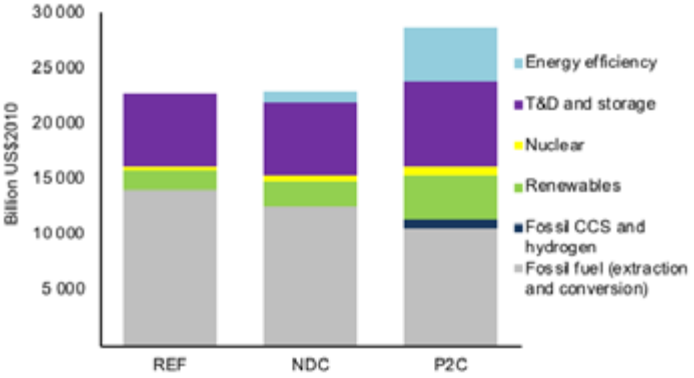


Source: UNECE (2020), Pathways to Sustainable Energy: Accelerating Energy Transition in the UNECE Region

Investment Requirements (2020 – 2050)

In the REF scenario, cumulative investments of US$ 23.5 trillion would be required, half of which would be for extraction of fossil fuels. Power generation investments would be dominated by hydro and wind followed by nuclear and solar.

Figure 3 Energy Sector Investment Requirements under Alternative Scenarios



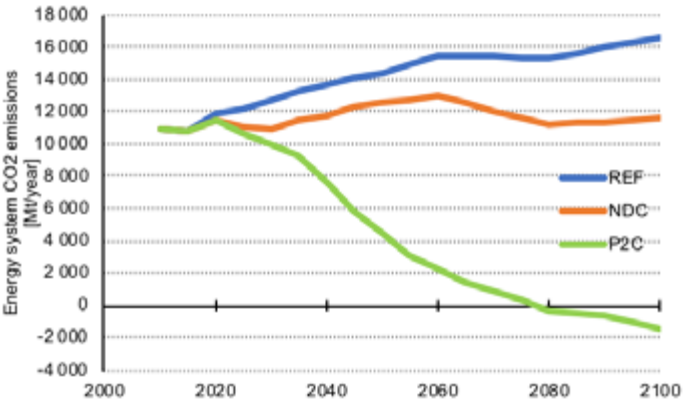
Source: UNECE (2020), Pathways to Sustainable Energy: Accelerating Energy Transition in the UNECE Region

In the NDC scenario, investments would be US$ 800 billion higher than the REF amount.

The P2C scenario would require US$ 6 trillion more than the REF amount, or US$ 200 billion annually. Spread over all economies and over the indicated timeframe, this sum is considered manageable in view of savings in anticipated costs related to climate change in terms of health, famine, property losses, and biodiversity.

Meeting the Paris Commitments

Figure 4 CO2 Emissions by Scenario



Source: UNECE (2020), Pathways to Sustainable Energy: Accelerating Energy Transition in the UNECE Region

Investments are required across a broad range of zero emission and GHG emissions reducing technology and across all subregions, to enable a transition to sustainable energy.

Commitments to date are insufficient to achieve a 2°C target, and more determined action is needed before 2030.

• In the REF scenario, a temperature increase of 4.2°C is expected by 2100. Cumulative emissions would amount to 1,250 Gt CO2. Under this scenario the impacts of climate change would be severe, triggering irreversible changes in the climate system, and the world would not have the resources to adapt.

• In the NDC scenario, a temperature increase of 3.0°C is anticipated by 2100. Cumulative regional emissions would be 225 Gt CO2 lower than the REF scenario. Under this scenario the impacts of climate change also would be severe and would trigger changes in the climate system with serious consequences for the economy and society as a whole.

• In the P2C scenario, a temperature increase of 2.1°C would be expected by 2100. Under this scenario, emissions would peak by 2020, and negative emissions would be imperative after 2070.Climate change would still cause more extreme weather patterns, major damage to coral reefs and marine systems, and substantial shifts in agriculture.

Carbon capture and storage is crucial for keeping the region on track to meet the 2°C target and attain sustainable energy. By 2050, the region must have the installed capacity to sequester 5 Gt/yr of carbon dioxide. Current capacity is in the tens of millions of tonnes per year. While decarbonisation of electricity generation and of the overall economy could progress moderately, this would not be the case for the entire UNECE energy system. The carbon intensity of 'total primary energy supply' (TPES) would remain almost unchanged at the 2020 value. Electricity generation represents a priority opportunity for achieving carbon neutrality, but decarbonisation targets after 2050 would become increasingly harder to meet.

Though there are only modest differences in the energy mixes of the NDC and REF scenarios, there are nevertheless a few important differences in their respective indicators. First, all carbon intensities are consistently lower in the NDC scenario compared to the REF scenario, including the carbon intensity of TPES. Second, the share of renewable energy is slightly higher in the NDC scenario than in the REF scenario. In the NDC scenario, the increase in expenditures is driven by the effective NDC constraints, and exhibits the beginnings of energy system transformation in the region beyond the business-as-usual rate of change.

Across the entire region, it is the P2C scenario that shows progress towards the Sustainable Energy Goals most dramatically. All GHG related indicators would improve significantly. The carbon intensity of TPES, electricity and GDP would be between 60% (TPES) and 85% (electricity generation), lower by 2050 than in the REF scenario. The improvements in these environmental indicators would be driven by increased investments in energy efficiency measures, resulting in 30% lower energy intensities, and an 80% share of near-zero carbon supply of energy provided by renewable energy, nuclear and fossil-based electricity generation equipped with carbon capture and storage. Until 2030, energy expenditures per GDP and total energy sector cost per GDP would be largely comparable to NDC. The main differences would emerge between 2030 and 2050.

Energy Access

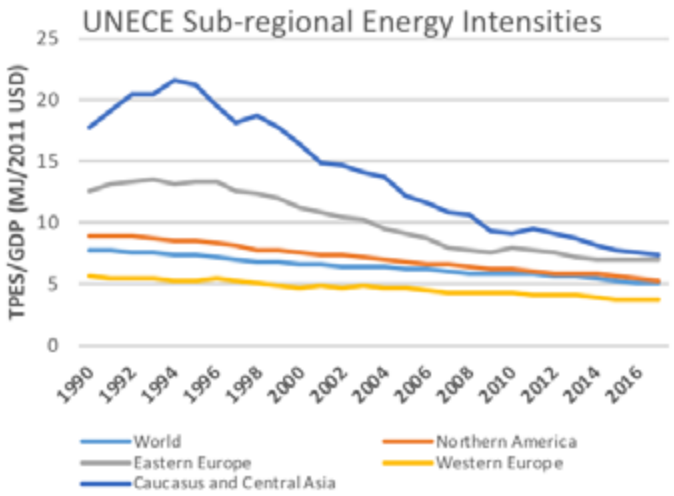
The UNECE region is comprised of high and low income countries, countries that are energy rich and energy poor, and countries that are in economic transition. In many countries across the region energy poverty still needs to be tackled, and an energy transition should avoid increasing energy poverty.

Even within the European Union (EU) the majority of countries have 'moderately high' to 'extreme' levels of energy poverty among low-income households. Energy poverty is especially prevalent in countries in the south and east sections of the EU. In Central and Eastern Europe, over 50 million EU citizens cannot afford sufficient energy to support their health and well-being. Elderly people are the most vulnerable as energy bills sometimes equal 30% of their monthly pensions. This situation is more severe in the countries with lower levels of economic development in Central Asia, Eastern Europe and the Caucasus. Poor insulation of buildings is a key area for action across these subregions.

Socioeconomic factors play the main role in high energy poverty levels. Countries with better building regulations and higher GDP per capita have lower levels of energy poverty. Policy action is needed to address poorly maintained infrastructure, and buildings are an easy target.

Energy Efficiency

Figure 5 - UNECE Sub-regional Energy Intensities



Source: UNECE (2020), Pathways to Sustainable Energy: Accelerating Energy Transition in the UNECE Region

Figure 5 shows the evolution of energy intensities in the subregions of the UNECE region, and for the whole world. Energy intensity is an imperfect proxy for measuring energy efficiency improvements, as it does not segregate efficiency improvements from structural shifts in economies or energy savings from process shifts within industries (electric arc furnaces, for example). Nevertheless, the figure shows progressive improvements in energy efficiencies since 1990. The rise in energy intensities in Eastern Europe, the Caucasus, and Central Asia in the early to mid-1990s reflects the dramatic drop in GDP values as the region shifted from centrally planned to market economies.

Improving the overall performance of buildings is central to meeting the sustainability challenge, as buildings directly consume over 70% of the electric power generated, and are responsible for 40% of primary energy and 40% of CO2 emissions by virtue of the energy services they require.

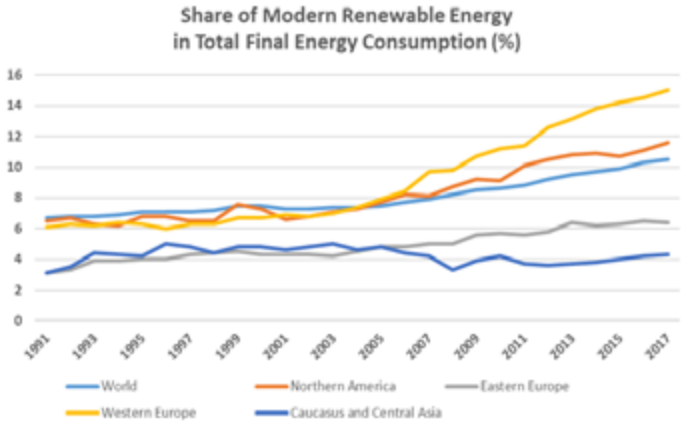
In industry, saving energy brings financial benefits to companies, through the value of the energy saved and through increased productivity from process optimisation.

In the area of transport, compulsory fuel economy standards play a pivotal role. Changes in customer preferences coupled with the speed of innovation and commercialisation of new technology and fuel sources, such as electric vehicles, biofuels and hydrogen, are expected to drive decarbonisation of the transport sector. The modernisation of urban mobility can be addressed with proper planning of city infrastructure and transport efficiency. Long distance freight transport remains a challenge, however, due to the volume and complexity of the transportation system.

Renewable Energy

Renewable energy is a key element of energy system transformation. The competitiveness of renewable energy has been improving progressively. Despite the overall increase in renewable energy capacity, and its rising share of the energy supply in the region, in some subregions the potential of renewable energy remains untapped.

Figure 6 - Share of Modern Renewable Energy in TFEC



Source: UNECE (2020), Pathways to Sustainable Energy: Accelerating Energy Transition in the UNECE Region

In 2015, the installed electricity capacity of renewable energy sources in the UNECE region amounted to about 869 GW (388 GW from large hydro power plants), accounting for almost half (49%) of the renewable electricity capacity installed worldwide.

Increased installed capacity of renewable energy technologies in many UNECE countries has driven a reduction in capital costs and increased investor confidence in lifecycle costs, improving their economic viability.

Still, the role of renewable energy in the energy mix across the UNECE region is highly variable. While Europe and North America account for 23% and 16% of the total renewable generation capacity, the Caucasus, Central Asia and Russian Federation collectively account for only 4%.

• Hydropower continues to generate a large share of electricity in the eastern subregions especially in the Russian Federation, Georgia, Kyrgyzstan and Tadjikistan.

• Solar PV is growing across all subregions, mainly driven by installations imported from China. Kazakhstan, however, has started investing in local manufacturing of solar PV modules.

• Vast wind potential is present in the region, with the largest sources in the Russian Federation, Belarus, Ukraine and Serbia.

The renewable energy sector in the Caucasus, Central Asia, Eastern Europe and South East Europe remains in its infancy, though significant opportunities to develop renewable energy remain untapped.

There is a need for institutional investment and transaction frameworks. Poor governance and lack of long-term goals, coupled with lack of technical local capacity and data on potential of renewables, have been regularly identified as the main barriers impeding the deployment of renewables in these subregions.

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POLICY BRIEF

ACHIEVING SDG 7 IN LATIN AMERICA AND THE CARIBBEAN

Contributing organisations:

United Nations Economic Commission for Latin America and the Caribbean

KEY MESSAGES

Progress towards the achievement of SDG 7

The region continues to make progress in the implementation of SDG 7. Access to electricity has improved, and the region's energy intensity has maintained a downward trend, particularly in the Caribbean. However, in spite of the positive advances, it is necessary to redouble efforts, otherwise it will be more difficult to achieve the objectives set for 2030, particularly in the countries with the greatest backlogs.

Access to electricity

According to the national data available at ECLAC and the Latin American Energy Organization (OLADE, 2019), as of 2018 about 18 million people still did not have access to electricity. Overall coverage was about 99%, but rural areas remained disadvantaged, with coverage in 2018 of around than 95%.

Access to clean cooking technologies

In many LAC countries, including Haiti, Guatemala, Honduras, Paraguay, Nicaragua, Guyana, Peru, Dominica, Belize, Bolivia, Jamaica, Mexico and Panama, more than 10% of the population does not have access to clean technologies for cooking. As around 83 million people within the LAC still lack access to such sources, the region is unlikely to reach the 2030 target without replacement of traditional biomass in cooking and heating uses by modern sources, and a long-term focus on electrification for cooking needs.

Renewable energy

The region has continued to make significant progress on incorporating renewable energy. Installed capacity of hydro energy increased from 154 GW to 191.2 GW between 2010 and 2018. However, its share of the energy mix has decreased due to increases in the use of wind and solar energy. Wind energy has become the largest source of variable renewable generation, with 25 GW installed in 2018. Solar energy sources are also registering significant progress, reaching 8.7 GW in 2018. Non-renewable thermal sources grew approximately half as much as renewable energies between 2010 and 2018, and that trend will continue as government policies promote the participation of renewable energies.

Energy efficiency

The LAC region has historically had the lowest energy intensity in the world. However, there has been no reduction in the region's energy intensity level since 2014, and additional efforts will be required to reach the target set for 2030.

Priority Actions

- Reinforce the active role of governments as facilitators of the development of the energy sector in order to allow each country's comparative advantages (endowments of natural resources) to be converted into competitive advantages in terms of access to clean and accessible energy. Over time, integrate a change of the energy matrix towards renewable and sustainable sources, move towards convergence between energy prices and production costs, and reduce subsidies to fossil fuels, while developing mechanisms that guarantee benefits to the most vulnerable populations.
- Promote the inclusion of non-conventional renewable energy technologies in policies, programmes and projects for energy access, particularly in rural areas, and implement government policies that encourage the development of renewable energies.
- Deepen the implementation of national programmes to promote the use of efficient and clean wood stoves, with an emphasis on caring for the environment, protecting people's health and paying attention to the socio-cultural aspects in which families live. Over time, support the replacement of traditional biomass in cooking and heating uses by modern sources and electrification.
- Promote the development of National Energy Efficiency Plans that define goals, provide instruments, and have the resources necessary for implementation.

ENERGY AND THE SUSTAINABLE DEVELOPMENT GOALS

Energy is an essential factor for the development of all economic sectors and human settlements. However, there is evidence that the use of polluting fossil energy sources is unsustainable. As a result, the idea of a major environmental boost through the decarbonisation of the energy matrix has emerged, with the aim of reducing dependence on fossil fuels and moving towards socio-environmental sustainability.

The data included in this Policy Brief show the progress made in Latin America and the Caribbean in addressing the targets set out in SDG 7.
SDG 7 energy targets for 2030 represent an important step in the UN's efforts to focus on the social, environmental, economic and policy challenges related to the production, distribution and access to energy.

It is easy to see the important role of energy in almost all of the great challenges and opportunities facing the world today. For the SDGs goals to be achieved, and for the world to develop sustainably, it will be necessary to ensure access to affordable, reliable, sustainable and modern energy services, while reducing greenhouse gas emissions and the carbon footprint of the energy sector.

The sustained adoption of clean and affordable cooking solutions can particularly improve the health and well-being of millions of people, and in this regard, it is important to alleviate the harmful health effects (particularly for women and children) caused by the burning of traditional solid fuels such as firewood, charcoal or agricultural residues for cooking at home. Avoiding their use also generates additional benefits by saving time that would otherwise be spent collecting or buying solid cooking fuels, allowing children to spend more time studying and allowing women to generate livelihoods and income through other productive activities.

Current approaches to energy are not sustainable in economic, environmental or social terms, in the face of global population growth and increasing demand for energy services. Consequently, there is a need to shift to more sustainable energy systems, where both increased use of renewable energy and significant improvements in fossil fuel energy efficiency have an important role to play and are not mutually exclusive. It is therefore a question of focusing the debate on the essential role that energy plays in the global sustainable development agenda, while at the same time emphasising the need to protect the environment (paying special attention to the negative environmental impact of conventional approaches to energy) and promoting the conservation of non-renewable resources.

The promotion of energy efficiency positively impacts the productivity and competitiveness of economies, reduces investment needs in the energy industry, improves security of supply, reduces energy bills in households, facilitates access to new and modern sources, promotes technological improvement, mitigates negative effects on the environment, and contributes to the conservation of non-renewable energy (increasing its future availability). As a result, improved energy efficiency has a positive impact on many of the SDGs.

Access to Electricity

Latin America and the Caribbean have been successful in moving towards universal access to electricity services. The region has steadily expanded its coverage since 2000, reducing the overall deficit from 43.6 million people in 2000 to 18 million in 2018.

Data from the Latin American Energy Organization in its Energy Outlook for Latin America and the Caribbean (OLADE, 2019) showed that about 18 million people still did not have access to electricity as of 2018. At the country level, in Haiti, Honduras, Guyana, Suriname, Bolivia, Belize, Guatemala, Panama and Nicaragua, more than 5% of the people lack electricity coverage (SIELAC, information based on country sources).

In urban areas, there is a deficit of only around 0.5%, which indicates that universal access to electricity is highly likely by 2030. While at the rural level, in 2018 there was more than 5% of the population does not have electricity coverage (OLADE, SIELAC Database). The urban-rural electrification gap narrowed from

2000 to 2018. To further address this gap, urgent policy action is required to promote decentralisation of electricity generation, and to continue to incorporate renewable energies. Since they do not require networks fed by centralised generation sources, renewable energy systems make it possible to use local energy resources.

In some countries in the region, it has been observed that the development of renewable energy projects at the rural level involves the integration of peasant and indigenous communities. A document produced by the Government of Chile, Indigenous Chapter of Energy Policy 2050, describes how policies have been based on an understanding of the social, cultural, political and ecological principles that have governed these societies for centuries, and from this paradigm the institutional strategy for the electrification of the rural sector has been developed.

Despite an encouraging regional perspective, subregional data show significant deficits in electricity access, particularly in the Caribbean. In 2017, the overall gap in the Caribbean was 15.4%, with coverage increasing very slowly, following a pace similar to population growth. However, Haiti had a deficit of 61% (around 39% of Haiti's population lives in rural areas). Another country with a considerable gap is Grenada, with an 8% deficit (64.3% of the population is rural). Bolivia and Guatemala will also have to make additional efforts to ensure that the population without access is connected, to reach values close to 100% by 2030.

Access to Clean Fuels and Technologies for Cooking (CFT)

The figures per country for access to modern energy sources for cooking use are uneven. One group of countries has a participation rate of 90% to 100%. But in Haiti, Guatemala, Honduras, Paraguay, Nicaragua, Guyana, Peru, Dominica, Belize, Bolivia, Jamaica, Mexico and Panama, the participation rate is less than 90% of the people. In some countries, access is much lower. Nicaragua, Honduras, and Guatemala have rates of access to CFT between 65% and 45%, while in Haiti it is only 4.34%.

Despite the great dynamism observed in the region, given current trends, additional efforts are required in countries where the use of firewood and charcoal are the main fuels for cooking food.

In addition, WHO (WHO, 2006) has approached this indicator from the perspective of food safety. According to the WHO[1], around 13% of the population of Latin America and the Caribbean (about 83 million people in 2016) may not consume safe food because they do not have access to modern cooking and refrigeration technologies. This constitutes a public health problem and poses a high risk to people's lives, as food-related diseases are increasing.

As a general conclusion, Latin America is on the road to a transition away from inefficient solid fuels for cooking. Ecuador is notably working to transition households from LPG to renewable electricity for cooking. Clean cooking has also been a priority of the Peruvian government for several years, and Peru is beginning to see substantial progress.

It is important to note that the authorities are working specifically to increase the expansion of clean gaseous fuels in rural areas, and are taking advantage of existing alternative mechanisms, such as energy infrastructure, to facilitate the distribution of gaseous fuels in these areas.

In all regions, there is greater access to clean energy in urban areas than in rural areas. It is therefore recommended that efforts be increased to build the infrastructure necessary for a reliable and affordable supply of clean cooking solutions in rural areas, particularly as those households already face other challenges in accessing services for basic needs.

There are reasonable expectations that by 2030 the region as a whole will be able to reach the objective outlined in SDG 7.1.

Renewable Energy

The regional power sector has continued to make significant progress on incorporating renewable energy. Installed capacity of hydro energy increased from 154 GW to 191.2 GW between 2010 and 2018. However, its overall share has decreased around 5.4%, given the penetration of wind and solar energy. Wind energy is the largest source of variable renewable generation, with 25 GW installed in 2018. Solar energy

1 Data kindly provided by the WHO

sources are also showing significant progress, reaching 8.7 GW in 2018. Non-renewable thermal sources grew approximately half as much as renewable energies between 2010 and 2018.

The power sector in the LAC region has a significant proportion of installed capacity of renewable energy (58.9%) compared to other regions (OLADE, 2019). In 2018, the accumulated installed capacity in the LAC region reached about 419 GW (247GW Renewable, 167 GW fossil, and 5 GW Nuclear), with about 80.2 GW of new installations from 2010 to 2018. Capacity expansion rates for installed renewable energy capacity show significant increases from 2014 onwards, and this trend is expected to continue thanks to the policies such as mechanisms for bidding and auctions of renewable energy projects, tax benefits for importing renewable energy technologies, and accelerated depreciation of assets. However, all types of energy sources have increased their installed capacity. The region is not replacing fossil sources with renewables by means of regulations that prevent the installation of new fossil-fuel generation plants, but rather is incorporating both sources as demand increases, which is why CO2 emissions continue to rise. Although fossil energies are growing at a slower rate than renewables, new projects are still being installed.

Hydroelectricity remains a cost-efficient technology, constituting the main source of generation in LAC. But over time, hydroelectricity will likely play less of a role than renewable energies such as wind and solar. The LAC region experienced fewer rain events between 2017 and 2019, resulting in a severe drought that affected Argentina, Uruguay, Venezuela and northeast Brazil. The variation in climate has reinforced the need for regional interconnections to make up for the energy deficit. In this regard, Bolivia (through ENDE, the state-owned power company) is developing an interconnection to Argentina, while Brazil, Paraguay and Peru are in the process of developing connections. Plans have also been made for a 500 kV transmission line project to connect Ecuador and Peru.

LAC is moving towards diversification of the generation matrix to protect countries from the impacts of climate events such as droughts and floods. Argentina is seeking to increase its renewable matrix (such as wind and solar energy) from 2% to 20% by 2025, and in Chile policy is moving towards excluding coal-fired generation sources.

The levelized cost of solar photovoltaic energy continues to decrease, reaching $0.11 US$/KWh in South America, and $0.12 US$/KWh in Central America. Wind energy costs reached $0.06 US$/KWh in South America and $0.10 US$/KWh in Central America (IRENA, 2018).

Data on foreign direct investment in renewable energies show that from 2010 to 2018 the region saw decreased investment in renewable thermal, geothermal and hydro energy, while non-conventional renewable projects such as solar and wind energy increased considerably. These two types of energy have decreased drastically in cost, which is why there has been significant progress in investment in these projects in recent years.

Hydro electric energy added 18.5 GW of installed capacity from 2015 to 2018. Brazil contributed around 68% of the new hydro capacity installed in this period. There is an increasing need to modernise large ageing hydro infrastructure to extend the life of assets and to boost electricity generation to meet growing electricity demand. As initially described, from the total 247 GW of accumulated renewable installed capacity, 191.2 GW are from hydro, representing 77.5% of total renewable capacity. Wind energy has made significant progress in terms of installed capacity, adding 11 GW of power, reaching 25 GW installed. The installed capacity of renewable thermal energy (biomass), is 20.6 GW, while solar is 8.7 GW and geothermal is 1.3 GW.

Despite the positive trend observed in recent years, these levels are still far from achieving the goal of SDG 7.2. However, the great dynamism observed in the development of non-conventional renewable energies and also hydroelectric, generates favourable expectations of being able to achieve significant progress in increasing levels of participation of modern renewable energies.

Energy Efficiency

With regard to energy efficiency, the Latin American and Caribbean region has the lowest energy intensity indices in the world, but also the lowest rates of improvement (around 0.5% per year). Between 1990 and 2015, energy intensity decreased from 4.3 MJ/

GDP to 3.8 (US$ according to the 2011 PPP), However, the level of energy intensity has remained constant since 2014.

In reference to the behaviour of energy intensity at the subregional level, Central America and the Caribbean show decreasing trends. The Caribbean is the subregion that has improved most in this respect, going from being the most energy-intensive to the least. Central America showed improvements from 2016 to 2018.

The annual change in primary energy intensity GDP US$ 2011 PPP at the subregional level (percentages) can be seen at Figure 1 (CEPAL, 2019).

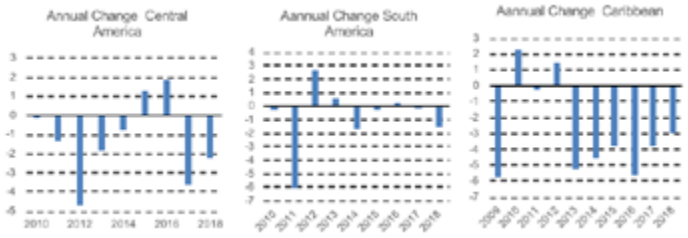

Figure 1

Based on Figure 1, the Caribbean has seen an important improvement trend, with a negative annual change from 2013 to 2018. Central America shifted from an increase of almost 20% in 2016 to decreases of 30% and 23% in 2017 and 2018 respectively.
Improvements in energy efficiency are due to the replacement of firewood with more efficient sources such as gas. It should be noted that electrification has also contributed to improving efficiency rates, as it allows the use of more efficient and modern energy sources in various tasks in the residential and industrial subsectors. The industrial subsector has contributed substantially to the reduction of energy intensity, indicating that the energy efficiency plans imposed on the sector have been successful.

Energy intensity must be focused on strategies that do not compromise economic development or harm people's lives, helping to decouple economic growth from energy consumption, and raising the comfort levels of the population, with the minimum possible energy consumption. Indicator SDG 7.3 proposes doubling the rate of improvement in energy efficiency with respect to indicators that date back to 2015. In this sense, the achievement of the 2030 target can only be achieved by accelerating the rates of reduction in energy intensity. Therefore, improving efficiency will require additional efforts beyond those that have been made. However, if the stationary trend in the rate of improvement in regional energy efficiency is not reversed, the region will hardly be able to achieve the objective (CEPAL, 2017).

POLICY IMPLICATIONS/RECOMMENDATIONS

An analysis of indicators to monitor the implementation of SDG 7 clearly establishes the urgent need to intensify efforts. One of the greatest challenges is achieving greater commitments to bolder policies, and the willingness to adopt such policies. A major constraint in the region is access to increased financing.

Given the great heterogeneity of the region, it is necessary to develop solutions for each country based on its socioeconomic characteristics, the degree of development of its energy infrastructure, its geographical conditions, and the technologies available to address the challenges of its energy systems. Since 2010, the region has accelerated the adoption of policy measures in support of the implementation of SDG 7 and is definitely approaching a level of policy framework similar to that found in Europe.

Latin America and the Caribbean have made significant efforts to promote the use of renewable energy in transport but have paid little attention to the heating and cooling sector. When it comes to energy efficiency, there is more focus on the electricity sector, while heating and cooling, and transport are behind. Countries such as Chile, Mexico, Brazil and Uruguay stand out as leaders in the region, with policies that seek to advance implementation of SDG 7. In particular, the active role of the government as a facilita-

tor of the development of the energy sector should be reinforced based on the country's comparative advantages, emphasising its endowment of natural resources to provide access to clean and accessible energy.

Finally, from the analyses carried out in the previous section, we can see some general guidelines on where energy policies should focus in most countries.

• The bulk of the electricity access gap is in poorer settlements and remote, hard-to-reach places, where new connections are generally more expensive. In order to achieve universal access to electricity, it will be necessary to provide a permanent flow of economic resources for this purpose, whether from public or private funds, multilateral banking or international cooperation. Governments must also generate appropriate institutional and regulatory frameworks and develop human and organisational capacities that make an efficient allocation of resources possible.

• The inclusion of non-conventional renewable energy technologies in energy policies, programmes and projects, particularly in rural areas, plays an important role in expanding electricity coverage. This path should be deepened, with an approach that combines development of rural electrification with general provision of educational and health services within the framework of an integrated SDG agenda.

• For an adequate allocation of resources, it is essential to move towards convergence between energy prices and production costs. The application of subsidies as public policy instruments should be done through mechanisms that guarantee that they are specifically targeted. Their potential impact on poor households depends on such targeting, as well as the possibility of reasonably limiting distortions in consumption decisions that originate in subsidies, and of redirecting resources to other priority uses.

• Government policies have contributed to the formation of more renewable electricity generation through, the development of important hydroelectric ventures and the incorporation of non-conventional renewable energies, such as wind and solar. In order to achieve the desired SDG 7 results, it is imperative that these policies be sustained over time. Furthermore, in order to achieve the large investments (public and private) needed to increase the share of renewable energies, stable institutional and regulatory frameworks, clear rules and transparent procedures will be required. Transport is one of the sectors with great opportunities to increase the share of renewable energies. An integrated approach to the problem could have excellent results in favour of sustainable development.

• In several countries of the region, traditional biomass will continue to occupy a prominent place in the uses of cooking and heating. Within this framework, and in parallel with efforts to continue improving access to modern sources of energy for cooking, the implementation of national programmes to promote the use of efficient and clean wood-burning stoves should be deepened, with emphasis on care for the environment, protection of people's health, and attention to the socio-cultural aspects in which families live. Programmes that have the greatest probability of success are those that promote the direct and conscious participation of the beneficiaries, rely on the technical skills of the communities, stimulate the innovative capacity of their organisations, and incorporate gender considerations in the processes of elaboration, design and implementation of a technology.

• For energy efficiency to improve, countries must have consolidated regulatory and organisational schemes, trained technical teams, and robust financing mechanisms that allow them to ensure the continuity of their activities over time. Only in this context can energy efficiency become a permanent component of energy policies and a substantial part of sector planning.

• The region has significant experience in the development of energy efficiency programmes and projects, and in the implementation of technical standards. But the lack of a comprehensive approach to the issue is often a source of inefficiencies and squandering of resources. To this end, the elaboration of National Energy Efficiency Plans, which define goals and provide instruments to achieve them, helps to break down and stimulate the development of market mechanisms that facilitate the participation of the private sector. Adequate monitoring of the Plans requires a good base of energy statistics and a set of specific indicators that are methodologically consistent. Improved and expanded information collection and processing would facilitate evaluation of the programmes. Energy efficiency labelling systems to

inform users and consumers are important in order to promote rational purchasing decisions. Likewise, the implementation of minimum energy efficiency standards should be promoted in order to gradually eliminate from the market the most inefficient equipment and elements in terms of energy consumption.

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POLICY BRIEF

ADVANCING SDG 7 IN LEAST DEVELOPED COUNTRIES

Contributing organisations:

UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States (UN-OHRLLS), the International Renewable Energy Agency (IRENA), UN Industrial Development Organisation (UNIDO) and the Rocky Mountain Institute

KEY MESSAGES

Without urgent and enhanced action, the 47 least developed countries (LDCs) will not be able to reach the SDG 7 targets by 2030. Despite the extraordinary growth potential for the energy sector in LDCs, these countries rarely benefit from larger financing schemes to the same extent as other, more prosperous, developing countries. Sustainable energy should therefore be one of the central thematic topics of the new 10-year programme of action for the LDCs to be adopted at the Fifth UN Conference on the LDCs in 2021.

Ending energy poverty in LDCs will require a radical change of pace and massive investment in the next few years. In addition, creating an enabling environment for investment and promoting attractive project pipelines will require well-functioning institutions, as well as public policy and regulatory reforms to help build credibility with investors and effectively scale up private investment.

Access to electricity

Only 52% of the overall LDC population had access to electricity in 2018. There are also significant disparities between countries, and between rural and urban areas. In some LDCs, rural access rates are well below 10%. Improving transformational energy access that goes beyond meeting basic household needs but includes electricity for productive uses that can transform the economies of LDCs through renewable energy mini-grids and off-grids is essential. In addition, it is important to address inefficiencies in power utilities in order to improve generation capacity, transmission and distribution, and to developing regional integrated markets that follow joint standards and a common framework. Such markets are a prerequisite for the reduction of investment risks and the uptake of trade with sustainable energy products and services.

Renewables

With non-renewable energy capacity growing faster than renewables, it is clear that many LDCs have not been able to benefit significantly from recent trends in technology development and falling costs of renewables. Expanding solar, wind and geothermal can now be done rapidly and relatively cheaply, and LDCs could seize the opportunity to leapfrog straight to renewable technologies.

Access to clean cooking

In 2018, only 16% of the people in LDCs had access to clean fuels and technologies for cooking. In 22 LDCs, mostly in Africa, it was less than 5%. Despite substantial benefits for health, gender inequality and environmental degradation, the clean cooking sector has not been able to attract much-needed financing. Thus, LDCs and their development partners need to make clean cooking a political priority, through specific policies, cross-sectoral plans and public investments supported by multi-stakeholder partnerships.

Energy efficiency

Improving energy efficiency is also a priority for LDCs and plays a significant role in accelerating the energy transition. A positive trend concerning the average energy intensity of LDCs can be observed over the past decades with a rate of 7.97 MJ/US$ in the year 2000, followed by a rate of 5.77 MJ/US$ in 2010 and 5.34 MJ/US$ in 2017 (IEA; UNSD 2019). Improvement of transmission and distribution systems is essential for increasing energy efficiency in LDCs.

Impacts of COVID-19

The current COVID-19 crisis has brought the importance of investments in reliable energy access to the fore, especially in terms of health services and the use of ICT. Promoting decentralised renewable energy solutions can help LDCs in responding to the immediate health crisis by providing cost-effective electricity to rural health centres. In the post-pandemic recovery, such solutions can further provide job opportunities and boost economic activity, thus supporting social and economic recovery.

Urgent need for increased support

Funding allocated to sustainable energy in LDCs should be increased. Support should also be given to entrepreneurship in scaling-up decentralised energy solutions through innovative business models, training and education, and enhanced opportunities for women entrepreneurs. Innovative multi-stakeholder partnerships should be launched and supported by the international community to assist LDCs in their energy transition and tapping into their renewable energy sources.

LEAST DEVELOPED COUNTRIES MOVING TOWARDS THE FIFTH UN CONFERENCE ON LDCS

The least developed countries (LDCs) are a group of 47 countries, characterised by their low socio-economic development and vulnerability to external shocks. These countries are largely agrarian economies, suffering from low investment levels and low productivity. There are 33 LDCs in Africa, 13 in Asia and the Pacific, and 1 in Latin America. The LDC population is expected to increase from 1 billion in 2018 to 1.3 billion in 2030. Lack of access to sustainable energy remains a major bottleneck for LDCs' growth, with only 52% of the LDC population having access to electricity in 2018 (World Bank, 2020a; 2020b).

The structural impediments faced by the LDCs severely constrain their ability to increase productivity, foster economic growth and compete in global markets. The share of LDCs in world merchandise exports is still below one percent. Although several LDCs have achieved economic and social progress during the past decade, critical challenges remain.

The Fifth UN Conference on LDCs, to be held in Doha, Qatar, in 2021, will undertake a comprehensive appraisal of the implementation of the Istanbul Programme of Action by the LDCs and their development partners. Participants will share best practices and lessons learned, and identify obstacles and constraints encountered, as well as actions and initiatives needed to overcome them. The Conference will result in a new 10-year-programme of action for the LDCs, which will coincide with the final decade of the implementation of the 2030 Agenda.

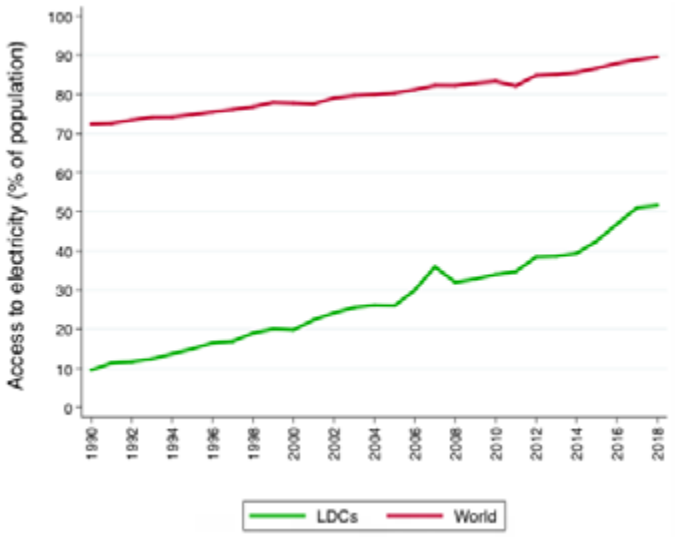
This policy brief will discuss the progress the least developed countries are making towards achieving SDG 7 and what is needed to accelerate their energy transition.

LDCs' progress towards reaching universal electricity access

Reaching universal access to modern energy in LDCs by 2030 offers an opportunity for transformative change that will end energy poverty and accelerate progress towards almost all Sustainable Development Goals (SDGs) in LDCs.

LDCs have made considerable progress in increasing access to electricity. Looking at the decade of the Istanbul Programme of Action (IPoA), access to electricity measured as a percentage of population grew from 35% in 2011 to 52% in 2018 for the group of LDCs, while the average global electrification rate reached 90% in 2018 (World Bank 2020a; 2020b). This shows that LDCs continue to follow the positive growth trend of the previous decade in which access to electricity grew by 52 per cent. However, more than half of the 789 million people in the world without electricity live in LDCs, while the average global electrification rate reached 90 per cent in 2018 (Figure 1).

Figure 1. Access to Electricity LDCs vs. World

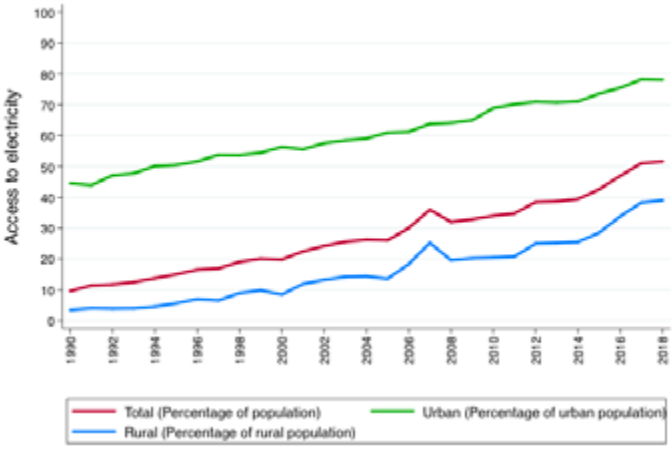


Source: World Bank, 2020a; 2020b.

The LDC electricity access data hides disparities between countries and regions, as well as urban and rural areas. In 2018, on average, 78% of the urban population in LDCs had electricity access, compared with only 39% of rural populations. (Figure 2).

The 13 Asia-Pacific LDCs[1] reached an average electrification rate of 83%, while the rate in the 33 African LDCs and Haiti was much lower, at 36%. Interestingly, while growth was mainly driven by Asia-Pacific LDCs in the decade 2001-2010, African LDCs were the main contributors to the growth results in the IPoA decade, with a growth rate of 66%. It is alarming, however, that 6 African LDCs still have electrification rates lower than 20% (an improvement from 15 in 2011).

Figure 2. Rural vs. Urban Access to Electricity in LDCs



Source: World Bank, 2020a; 2020b.

Assuming that in the following years the annual growth rate from 2017 to 2018 prevails, at least 19 African LDCs will most likely not achieve SDG 7, whereas the majority of Asia-Pacific LDCs will reach universal access. Bhutan, Kiribati and Tuvalu were the first three LDCs to achieve universal access in 2018. In Africa, Liberia, Rwanda, South Sudan and Uganda have demonstrated strong growth rates during the last decade (World Bank, 2020a; 2020b). See Annex I for access rates for all LDCs.

However, when discussing electricity access, SDG 7 goes beyond providing "only" an electricity connection, as there are high disparities between simply having access and having the optimum Tier Five access, as defined by the multi-tier framework for measuring energy access (Bhatia and Angelou, 2015).[2]

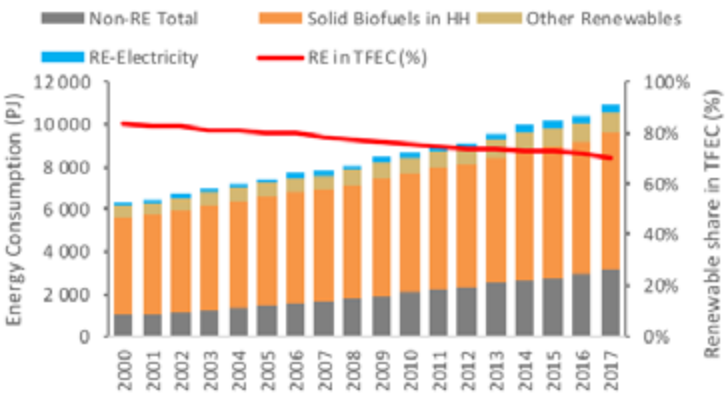
Climbing the "energy ladder" is a gradual process, from basic lighting systems up to full Tier Five access, and the socioeconomic benefits increase gradually when moving to higher tier levels for electricity access. Similarly, reliable electricity access is critical for boosting uptake and enhancing economic impact. When households and firms endure several hours a day without access to power, this limits end users' potential utilisation of electricity and reduces productivity (Blimpo and Cosgrove-Davies, 2019).

Furthermore, ensuring access to electricity must extend beyond households. Energy poverty in healthcare centres, schools and community facilities severely impacts the quality of service delivery. The COVID-19 pandemic has drawn renewed attention to the need for more concerted efforts on strengthening universal electrification of health facilities in LDCs.

Renewable energy in LDCs

While promising developments in renewable energy deployment have been witnessed on a global level during the last decade, LDCs as a group are falling behind and need to attract considerable support to scale up renewables. Across LDCs, the average share of renewable energy in total final energy consumption (TFEC) reached 70.8% in 2017, a decrease from 75.6% in 2010 (IEA; UNSD, 2019) (Figure 3). This overall share of renewables is high compared to the global average because a large percentage of the population relies on traditional uses of biomass – wood fuel, and crop and animal residues – for cooking and heating. Excluding traditional uses of biomass, the share of renewables in total final energy consumption reached 11.4% in 2017, up only marginally from 11.1% in 2010 (IEA; UNSD, 2019).

Figure 3. Total Final Energy Consumption and Share of Renewables by Technology Type in LDCs
Source: IEA; UNSD 2019.

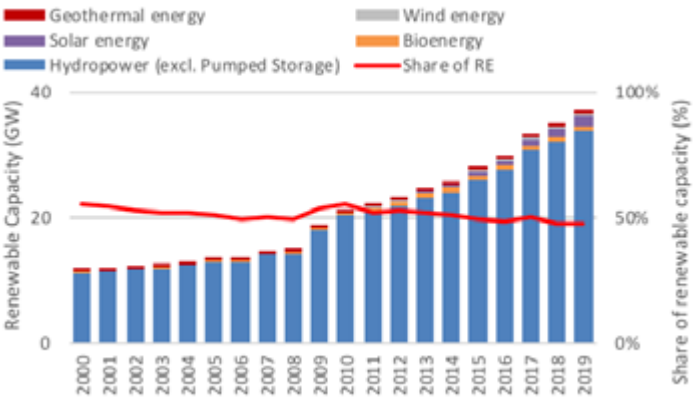


1 Throughout this report, where regional comparisons are made, Yemen is grouped with the Asia-Pacific LDCs and Haiti with African LDCs.

2 The multi-tier framework for measuring energy access outlined by the Energy Sector Management Assistance Program (ESMAP): https://www.esmap.org/node/55526

In the electricity sector, renewable capacity reached 48% in 2019, down from 55% in 2010 and 56% in 2000. Of the 36.8 gigawatts (GW) of installed renewable capacity in 2019, hydropower dominated at 33.8 GW, followed by 1.6 GW of solar energy, 1 GW of bioenergy, and 0.4 GW of wind (Figure 4).

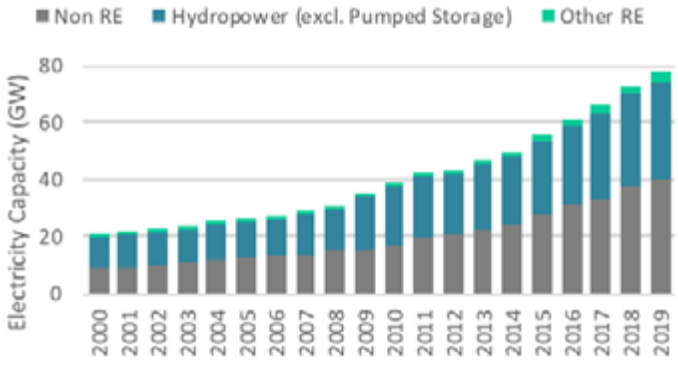
Figure 4. Renewable Electricity Capacity by Technology Type in LDCs
Source: IRENA, 2020.



Despite a more than three-fold absolute increase in installed renewable generation capacity since 2000, the overall share of renewables declined. This was due to a faster expansion of non-renewable generation capacity, which reached 40.6 GW in 2019, increasing more than four-fold since 2000 (IRENA, 2020) (Figure 5).

Variations exist between LDCs, as Cambodia, Liberia, Kiribati, Nepal among others have seen positive developments in the share of renewable generation capacity since 2010. However, some LDCs have substantially decreased their share of renewable capacity.

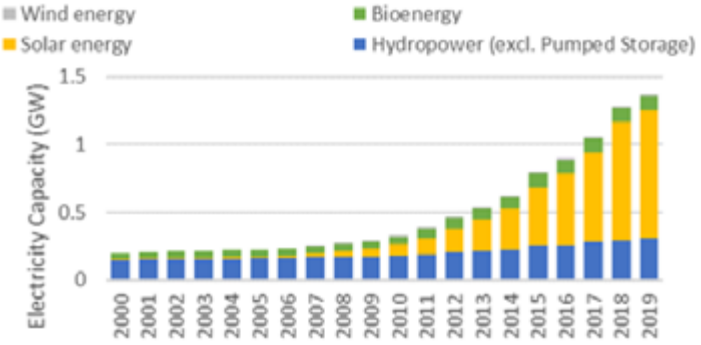
Figure 5. Electricity Capacity by technology type in LDCs
Source: IRENA, 2020.



LDCs are witnessing a more positive development in off-grid solutions, where renewables, including solar home systems and mini-grids, have seen a faster expansion than non-renewables since 2009. With a particularly strong uptake in Africa, many of the LDCs are looking to off-grid renewables as a cost-competitive option to provide energy access. In 2019, off-grid solutions in LDCs reached a total installed capacity of 1.4 GW, up from just over 0.3 GW in 2010. Almost half of this capacity (0.65 GW) was installed in African LDCs (IRENA, 2020) (Figure 6).

This increase in off-grid renewable energy solutions capacity served a total population of almost 47 million in 2018, up from 6 million people in 2010. This includes about 28 million using solar lights (<11 watts), 14 million using solar home systems (>11 watts), 3 million using hydro, and about 1 million connected to a mini-grid. While solar lights have been effective in providing the very initial level access on the energy ladder (Tier 0-1), high-capacity solar home systems and mini-grids based on solar, hydropower and biomass have the potential to provide a fuller range of energy services (Tier 1 and higher) and should therefore be a priority moving forward (IRENA, 2019a). See the example from Nepal in the Best Practices section.

Figure 6: Off-grid Renewable Electricity Capacity by Technology Type in LDCs



Source: IRENA, 2020

Key challenges faced in LDCs include a lack of inclusive policy frameworks for renewable energy as well as inadequate funding for new projects (including on-grid, off-grid and mini-grid projects). While the bulk of investment in the energy transition will need to come from private sources, public finance will play a significant enabling role to spur investment. IRENA and OECD's tracking of SDG 7.a.1 on international

public financial flows to developing countries in support of clean and renewable energy, shows that these flows reached a total of US$ 21.4 billion in 2017, however only 12% (US$ 2.7 billion) of this funding was directed towards LDCs. Between 2000 and 2017, LDCs have received an accumulated US$ 28 billion (2017 PPP) in support of renewables with US$ 20 billion of this funding going to hydropower projects. As the cost of renewables continues to decline, in particular for solar and wind, significant potential exists to accelerate achievement towards SDG 7, while at the same time advancing other SDGs. Increased efforts are needed to create enabling frameworks for renewables and make sure financial flows reach those most in need and support a just transition.

Energy efficiency

Improving energy efficiency is also a priority for LDCs and plays a significant role in accelerating the energy transition. A positive trend concerning the average energy intensity of LDCs can be observed over the past decades with a rate of 7.97 MJ/US$ in the year 2000, followed by a rate of 5.77 MJ/US$ in 2010 and 5.34 MJ/US$ in 2017 (IEA; UNSD 2019). The same trend can be observed on a global scale, with a falling average energy intensity rate.[3]

The improvement of transmission and distribution systems plays an important role in increasing energy efficiency in LDCs. Additional funding and technological innovation are needed for driving such improvements. In addition, vulnerable countries face serious operational and financial inefficiencies in their power utilities, and these need to be addressed as they impact significantly on the financial viability of the utilities. These inefficiencies reduce expected cash flows and result in regressive subsidies.

Also, LDCs have a tremendous potential to leapfrog to efficient energy systems that can directly harness energy where people and local industries are located, and ensure that maximum services are rendered from these locally controlled energy sources. Experience has shown that improving energy efficiency and implementing demand-side management programmes can be a cheaper alternative to building new supply.

Clean cooking

Universal access to clean and modern cooking fuels and technology is an integral element of ensuring that the broader aims of SDG 7 are realised. However, LDCs have largely been left behind in this area. In 2018, only 16% of the population in LDCs had access to clean fuels and technologies for cooking.[4] 22 LDCs, mostly in Africa, had less than 5% access, severely impacting people's health and the environment (WHO, 2020).

The harmful consequences of inefficient, traditional cooking methods contribute to poor health, gender inequality, environmental degradation, deforestation and air pollution. The lack of clean cooking solutions disproportionately affects the most vulnerable, especially women and children. The World Health Organization (WHO) estimates that household air pollution produced by rudimentary cookstoves is so toxic that it leads to around four million deaths every year (WHO, 2018). That figure exceeds the death toll attributed to malaria, tuberculosis and HIV/AIDS combined.

Despite the gains to be made, the clean cooking sector has not been able to attract much-needed financing. The total amount of finance for residential clean cooking dropped to US$ 32 million in 2017. The 2015-2016 estimated annual average was US$ 117 million, compared to the US$ 4.4 billion annual investment estimated to be needed to achieve universal access to clean cooking by 2030 (SEforAll, 2019).

Thus, LDCs and their development partners need to make clean cooking a political priority, and to design and implement specific policies, cross-sectoral plans and public investments supported by multi-stakeholder partnerships. Support for innovation and investment in R&D throughout the cooking value chain – technologies, policy, finance, regulation, awareness and behaviour – needs to be increased radically. In the long term, policies for clean cooking must become more ambitious, moving away from biomass

3 The energy efficiency is expressed in terms of the energy used to produce one unit of economic output and can also be defined as the energy intensity, measured in MJ/USD (2011 purchasing power parity). Weighted averages were calculated using the indicator GDP, PPP (constant 2011 international $), retrieved from World Development Indicators (World Bank 2020c).

4 Weighted averages were calculated using the indicator "Population, total", retrieved from World Development Indicators (World Bank 2020b).

and imported fossil fuels. Greater convergence between SDG 7 electrification and clean cooking goals can be fostered by planning and enhancing the adoption of modern electrical cooking appliances within electrification schemes on and off the grid.

BEST PRACTICES ON ACCELERATING ENERGY TRANSITION IN LEAST DEVELOPED COUNTRIES

The previous sections have demonstrated clearly that despite the progress achieved, a large majority of LDCs are not on track to achieving SDG 7 by 2030. The primary challenge for LDCs is to rapidly step up a sustainable energy transition so that considerable progress can be made towards achieving the national targets and international goals, such as those in the IPoA, the 2030 Agenda and the Paris Agreement, to which LDCs have committed themselves.

However, the energy sector in LDCs presents an extraordinary growth potential. Many LDCs have been able to tap into this growth potential and several success stories have already emerged. This section highlights some of these best practices, ranging from national level planning to support for local innovation.

Enabling frameworks for energy access and achieving SDG 7 in Malawi. A recent study by Malawi's Department of Energy Affairs, UN-OHRLLS and Rocky Mountain Institute demonstrated how whole-system energy investment planning can support countries with low access rates, like Malawi, in reaching SDG 7 at a lower cost, using abundant renewable resources. According to the investment study prepared, Malawi has an opportunity to achieve 100% access to electricity by 2030, starting from a current rate below 20%. The study estimates that Malawi will need to mobilise US$ 3 billion by 2030 to close gaps and reach its full energy potential, presenting an opportunity to save US$ 500 million by 2030, compared to previous plans. This investment, which will need to come from a combination of different sources, represents a tripling of generation capacity to 1200 megawatts while adding 1.2 million new grid connections.

The least-cost pathway identified in the study shows that by taking advantage of rapidly reducing costs of renewables and storage, Malawi can build modular, flexible energy infrastructure that closely tracks demand while providing reliable power and resilience to climate change. Demand-side management can save energy at a lower cost than new generation. At the same time, this pathway would avoid nearly 20MT of CO2 emissions by 2030 (OHRLLS et al., 2019). The study guides the Malawian Government, development partners, investors and the private sector to converge on a shared agenda to unlock investment in the energy sector. The study presents a set of simple actions that can unlock and scale up the funding Malawi needs, in a positive feedback loop that can help the energy sector to develop rapidly, sustainably and at the lowest cost.

Figure. 7 Five action areas for scaling up sustainable energy investment

Source: OHRLLS et al., 2019

Micro-hydropower development in Nepal. Besides providing energy for lighting and cooking, off-grid solutions are being increasingly deployed to sup-

port the development of livelihoods by powering productive end-uses such as agriculture. Nepal has a long-standing history of harnessing hydropower for agro-processing and the provision of electricity. The installed capacity of micro-hydro installations (up to 100 kW) has risen from an estimated 37 MW in 2011 (AEPC, 2011) to around 50 MW in 2018 (IRENA, 2020).

The majority of these micro-hydro installations are developed under a public-private partnership model where the community plays an active role in the implementation of the project to allow for a maximisation of socioeconomic benefits. To support the micro-hydro sector, the government introduced a Subsidy for Renewable Energy policy in 2000, with revisions in 2006, 2009, 2013 and 2016. To apply for a subsidy, communities need to register a users' group, a cooperative or a private company. Typically, the community mobilises half of the total project cost, with the balance provided as a subsidy by the Alternative Energy Promotion Centre (AEPC) (IRENA, 2018; World Bank, 2015). In addition to the subsidy, the government introduced in 2014 an interconnection mechanism that allows micro-hydro projects to connect to the main grid (should it arrive) under a power purchase agreement. Unexpected arrival of the main-grid is otherwise a major risk factor for mini-grid operations that could be faced with a decreasing number of customers and stranded investments.

With more than 2500 micro-hydro installations, Nepal demonstrates the possibilities offered by off-grid renewable energy. Challenges remain in reaching the full potential of the sector but many of these can be addressed through continued dialogue between community stakeholders and policy makers (IRENA, 2018).

Promoting renewable energy investments in Guinea Bissau. Over the past five years, UNIDO has supported the Government of Guinea Bissau in its efforts to implement power sector reform, which includes a shift from fossil fuels to renewable energy. However, apart from some solar home systems, the country initially had no real practical experience with renewable energy technologies, policies and legislation.

To kick-start the transition, UNIDO assisted the Ministry of Energy and Industry in the development of national action plans on renewable energy, energy efficiency and energy access. The plans include 2030 targets and concrete actions to achieve them. These plans aim at 50% renewable energy penetration in the national electricity grid. Around 9% of the population would be served by renewable energy powered mini-grids and stand-alone systems.

Support from UNIDO also included the design of a national sustainable energy investment plan amounting to US$ 680 million. Targeted investment facilitation mobilised around US$ 50 million from development banks, donors and the private sector for the implementation of priority projects such as utility-scale solar PV, hybrid mini-grids, and small hydropower.[5]

Supporting innovative partnerships and local innovation. The private sector (including SMEs, entrepreneurs and start-ups) has a central role in delivering local technology innovation to address the energy, environmental and economic challenges of today. However, SMEs and start-ups with clean technological and business model innovations often struggle with lack of support and weak innovation ecosystems in LDCs.

IRENA has been actively supporting renewable energy entrepreneurship in Africa through dedicated facilities. In partnership with the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), IRENA established the ECOWAS Renewable Energy Entrepreneurship Support Facility in 2015. The facility aims to enhance and strengthen the capacity of small to medium-sized entrepreneurs in the renewables sector (particularly solar PV) on technical issues (such as system sizing, installation guidelines, etc.), business management and operations. Through capacity building, technical advisory and mentorship support, over 80 enterprises from all 15 ECOWAS member countries have so far been assisted over three annual cohorts. Approximately US$ 1 million in debt financing was accessed through the project proposals submitted to local funding institutions. Following the successful implementation of the Facility in the ECOWAS region, IRENA joined together with the SADC Centre for Renewable Energy and Energy Efficiency to launch the SADC Renewable Energy Entrepreneurship Support Facility in April 2017 (IRENA, 2019b: p.14).

5 http://www.ecreee.org/news/unido-and-ecreee-support-guinea-bissau-making-sdg-7-reality-2030

Similarly, UNIDO has provided support to entrepreneurs developing climate and clean energy projects through its Private Financing Advisory Network. In Cambodia, ATEC Biodigesters International[6], a social enterprise, mobilised US$ 700,000 in equity after refining its business plan, financial projections and its investment pitch with the support provided. The enterprise created biodigesters with small farmers in mind to collect, treat and convert farm waste into gas used for cooking and organic fertiliser. The biodigesters come together with a modern cookstove and biogas rice cooker and as a result this innovative solution provides rural households with financial savings, home-made fertiliser for their farm and the comfort of a modern cookstove.

DECADE OF ACTION / POLICY RECOMMENDATIONS FOR FAST-TRACKING PROGRESS

While LDCs are making significant efforts to achieve SDG 7, they cannot do this alone, they will need strong support from all their partners, to scale up and speed up.

With the right policies and finance, LDCs can move rapidly towards a future of clean, affordable electricity for all. Distributed energy and mini-grids can be deployed quickly, providing resilient power supply in the face of crises such as climate change and the global pandemic. Low-cost, renewable generation makes it possible to power agricultural activities with electricity, reducing drudgery and saving money on diesel. At a later stage, affordable electrification needs to extend to cooking and transport, easing ecological pressure and reducing dependence on imports. Urban and rural development will accelerate with the availability of reliable power for services and enterprises, providing a foundation for sustainable development and national growth.

To realise the radical change needed, there is a need to create and implement action-oriented, inclusive policies that can fast-track progress in LDCs considerably over the next 10 years.

The **"leave no one behind"** principle involves considering the energy demand profiles of the poorest people and ensuring their access to affordable energy within national energy policies that are integrated into wider development strategies. The focus should be not only on promoting minimum access to households, but also on people's energy needs, seamless transmission, access for productive uses and social services, and economic development, with a gradual shift towards self-sustaining systems promoting economic development that is transformative and inclusive.

National sustainable energy policies should also make **clean cooking** a priority, followed by implementation of specific policies, cross-sectoral plans and public investments supported by multi-stakeholder partnerships. Holistic national programmes on the introduction of clean cooking fuels and technologies would include measures to build the capacity of local populations, especially women, to design, produce, install and maintain clean cooking equipment; create microfinance schemes for entrepreneurs and start-ups; and develop local value chains. As sustainable development co-benefits, such programmes would contribute to improving in-house air quality and reducing the risk of respiratory diseases in women and small children.

As the cost of **renewables** continues to decline, in particular for solar and wind, significant potential exists to accelerate achievement towards SDG 7, while at the same time advancing other SDGs. Off-grid and decentralised systems are being increasingly recognised as the most cost-effective solutions for the poorest and most remote communities, providing livelihoods and income-generating opportunities to households. However, they often remain unaffordable and underfunded. More market development, concessional financing and innovative partnerships

6 https://pfan.net/projects_and_stories/atec-biodigesters-international-cambodia/

are needed to unleash the potential of decentralised systems. LDCs have a strong potential for developing energy systems utilising renewable energy sources.

Despite the current oil price fluctuation and increased market unpredictability due to **COVID-19** pandemic, renewables should remain at the centre of LDCs' energy transition. Following existing long-term plans and commitments will be important for post-pandemic recovery, along with new goals to drive economic recovery supported by stimulus and recovery packages. A transition to renewable energy will help LDCs in building a more resilient, climate friendly energy future faster. Decentralised systems help to create new job opportunities and offer income-enhancing opportunities, thus supporting economic recovery. Also, a combined action from health and energy sectors to overcome institutional barriers as well as policy and financial gaps which hamper the widespread deployment of decentralised renewable energy solutions rural health centres. In 2018, IRENA convened a dedicated conference on this topic which identified several best practices that could help guide efforts by countries in this area.[7]

Focusing on national energy supply and productive uses can be a powerful tool for rebuilding economies based on agriculture and local supply and increasing LDCs' resilience to future shocks. For some LDCs, the recent drop in oil prices can also can also provide a good opportunity to lower or remove subsidies for fossil fuel consumption, as many subsidies are inefficiently targeted, disproportionally benefiting wealthier segments of the population that use much more of the subsidised fuel and leading to wasteful consumption.[8]

As the gap in **finance** needed to provide energy in LDCs is vast, development partners, IFIs and the private sector should increase funding allocated to sustainable energy in LDCs. This will have an impact across different sectors and accelerate poverty eradication and structural transformation. There is a need for financial and technical cooperation, and assistance from development partners, for energy generation, distribution and energy efficiency. Funding should also be directed to project preparation and capacity building for project development. Lack of maturity in energy access markets and underdeveloped financial markets in LDCs mean that DFIs will have to play a larger role in catalysing energy access investment.

In this regard, the Climate Investment Platform (CIP), launched by UNDP, IRENA and SEforALL, in coordination with the GCF, at the 2019 Climate Action Summit, could be useful in meeting the needs of LDCs. In preparing for the CIP, IRENA is organising investment forums in 14 sub-regional clusters.[9] These Investment Forums will strengthen the ability of decision-makers to produce a strong enabling environment for renewable energy investments and help the developers to prepare bankable projects and access finance.

LDCs with large energy **access gaps** are recommended to create a positive feedback loop that can help the energy sector develop rapidly, sustainably and at the lowest cost. Implementing "quick-win" generation projects is vital for unlocking further commercial finance. The feedback loop will vary depending on the unique mix of resources, opportunities and challenges of each LDC, but by implementing successfully new projects, LDCs can provide a track record, build internal capacity and help unlock further commercial financing.

It is also critical to act quickly to create **enabling environments** for both public and private sector investment and to promote nationally and locally appropriate and determined project pipelines in LDCs for consideration by both domestic and international actors. This will require well-functioning institutions, supportive public finance instruments and policy, and regulatory reforms to help build credibility with investors and effectively scale up appropriate private investment, leveraging public resources for country-level implementation.

Strengthening **regional cooperation** will be critical for fast-tracking progress, as it will ensure economies of scale, leverage the endowment of abundant natural resources, promote innovation, facilitate financing, support regional energy infrastructure to enhance energy security and advance economic integration. There is considerable scope for expanding regional power pools, which can significantly lower the overall

7 IRENA, Conference on Renewable Energy Solutions for Healthcare Facilities, Singapore, 2nd November 2018. Further information at: https://iorec.irena.org/Home/Healthcare

8 https://www.iea.org/commentaries/put-clean-energy-at-the-heart-of-stimulus-plans-to-counter-the-coronavirus-crisis

9 https://www.irena.org/irenaforcip

investment costs to achieve SDG 7 in LDCs.

Going forward, new and existing innovative **multi-stakeholder partnerships** to support LDCs in their energy transition will pave the way for achieving SDG 7. One such initiative is the Coalition for Sustainable Energy Access, which was launched at the Secretary-General's Climate Action Summit, in September 2019. The Coalition is spearheaded by Ethiopia and Morocco, and calls for bringing forward the countries that are furthest behind and accelerating the sustainable energy transition in LDCs.

The upcoming Fifth UN Conference on the LDCs should have a focus on sustainable energy as ensuring that everyone has access to affordable, reliable, and modern energy services by the year 2030 will provide opportunities for transformative changes that contribute to the achievement of a number of other SDGs in LDCs, including SDG 13 on taking urgent action to combat climate change and its impacts.

Annex I

Source: World Bank, 2020a; World Bank, 2020b; WHO, 2020
Weights for averages: Total population, Urban population and Rural population

	Access to Electricity (% of Population)				Urban Access to Electricity (% of Urban Population)				Rural Access to Electricity (% of Rural Population)				Access to Clean Fuels and Technology (% of Population)			
	2001	2011	2017	2018	2001	2011	2017	2018	2001	2011	2017	2018	2001	2011	2017	2018
All LDCs	**22,4**	**34,7**	**51,0**	**51,6**	**55,6**	**70,1**	**78,3**	**78,1**	**11,9**	**20,7**	**38,3**	**39,0**	**7,8**	**11,3**	**15,0**	**15,8**
Africa (incl. Haiti)	**15,5**	**21,6**	**33,4**	**35,9**	**42,2**	**59,6**	**68,8**	**69,9**	**6,2**	**6,5**	**16,4**	**19,5**	**5,8**	**7,6**	**9,0**	**9,2**
Angola	20,0	34,6	42,0	43,3	30,0	82,5	71,9	73,7	9,5	0,0	0,0	0,0	44,0	47,0	48,0	48,0
Benin	21,9	36,9	34,5	41,5	49,6	67,0	54,2	67,4	4,4	13,6	17,2	18,3	1,0	5,0	5,0	5,0
Burkina Faso	9,6	15,0	17,5	14,4	42,3	54,2	61,8	62,3	2,2	1,9	0,0	0,0	3,0	6,0	9,0	10,0
Burundi	3,3	6,2	9,3	11,0	50,6	52,8	61,8	61,7	0,0	0,5	1,7	3,4	0,0	0,0	0,0	0,0
Central African Republic	6,1	13,2	29,8	32,4	15,5	29,4	51,7	55,2	0,4	2,7	14,7	16,3	1,0	0,0	0,0	0,0
Chad	3,2	7,0	10,9	11,8	12,7	25,5	39,1	41,8	0,5	1,8	2,5	2,7	3,0	3,0	3,0	3,0
Comoros	42,1	69,6	79,4	81,9	66,1	85,4	92,4	94,0	32,8	63,4	74,2	77,0	0,0	4,0	7,0	8,0
Congo, Dem. Rep.	7,3	13,3	18,2	19,0	23,9	39,5	49,1	50,7	0,0	0,0	0,0	0,0	5,0	4,0	3,0	3,0
Djibouti	56,4	56,0	60,2	60,4	57,3	64,7	70,0	70,8	53,6	26,5	26,3	23,8	5,0	6,0	6,0	6,0
Eritrea	30,3	40,9	48,3	49,6	79,0	77,7	77,2	77,1	11,9	20,3	32,5	34,6	4,0	8,0	9,0	9,0
Ethiopia	25,6	23,0	44,3	45,0	79,5	85,2	96,6	92,0	16,1	9,6	31,0	32,7	1,0	2,0	5,0	5,0
Gambia, The	29,9	48,9	56,2	60,3	51,3	66,0	79,4	76,0	9,5	26,8	20,5	35,5	4,0	3,0	2,0	2,0
Guinea	16,8	28,6	35,4	44,0	57,7	73,5	84,4	87,0	0,0	5,4	8,1	19,7	1,0	1,0	1,0	1,0
Guinea-Bissau	0,2	13,3	26,0	28,7	22,0	28,1	48,2	53,1	0,0	3,2	9,3	10,0	2,0	1,0	1,0	1,0
Haiti	31,5	38,0	43,8	45,3	62,5	71,3	78,1	79,0	13,2	6,7	3,0	3,5	2,0	4,0	4,0	4,0
Lesotho	1,4	22,2	33,7	47,0	18,6	55,9	68,4	70,7	0,0	10,8	20,4	37,7	18,0	33,0	38,0	39,0
Liberia	0,0	4,1	24,2	25,9	0,0	7,2	40,5	43,6	0,0	1,2	7,4	7,4	0,0	0,0	0,0	0,0
Madagascar	14,8	14,3	24,1	25,9	42,1	61,5	68,4	69,6	4,5	0,0	0,0	0,0	2,0	1,0	1,0	1,0
Malawi	5,1	7,6	12,7	18,0	27,7	32,6	57,5	55,2	1,2	3,0	3,7	10,4	2,0	2,0	2,0	2,0
Mali	10,8	29,7	43,1	50,9	37,0	75,4	84,6	85,6	0,1	3,1	13,6	25,4	1,0	1,0	1,0	1,0
Mauritania	22,2	35,1	42,9	44,5	49,7	76,8	80,4	82,4	4,9	0,0	0,9	0,6	31,0	42,0	44,0	43,0
Mozambique	5,7	20,2	29,3	31,1	20,1	54,5	71,8	72,2	0,0	3,8	5,9	8,0	3,0	3,0	4,0	4,0
Niger	8,4	14,3	18,2	17,6	41,1	59,9	60,1	47,6	2,1	5,5	10,0	11,7	1,0	1,0	2,0	3,0
Rwanda	5,6	10,8	34,1	34,7	36,4	58,2	84,8	89,1	0,0	1,1	23,6	23,4	0,0	0,0	1,0	1,0
Sao Tome and Principe	52,2	61,3	69,7	71,0	64,4	69,9	76,4	76,7	37,7	44,6	52,7	55,7	0,0	1,0	2,0	3,0
Senegal	38,9	56,5	61,7	67,0	73,6	87,8	91,7	92,4	15,3	31,7	35,4	44,2	36,0	33,0	24,0	23,0
Sierra Leone	8,6	14,2	23,4	26,1	25,1	35,8	48,7	53,2	0,0	0,3	5,4	6,4	0,0	0,0	0,0	0,0
Somalia	6,6	22,7	33,4	35,3	24,3	45,5	58,3	60,5	0,0	6,8	13,5	14,6	0,0	1,0	2,0	3,0
South Sudan	0,0	5,4	25,1	28,2	0,0	14,8	41,7	46,8	0,0	3,4	21,1	23,7	1,0	0,0	0,0	0,0
Sudan	33,3	41,4	56,5	59,8	66,5	71,6	82,2	83,8	17,3	26,4	43,0	47,1	14,0	34,0	48,0	50,0
Tanzania, United Republic of	10,4	14,2	32,7	35,6	34,8	42,9	65,2	68,3	3,2	2,6	16,7	18,8	1,0	1,0	3,0	3,0
Togo	19,7	39,7	48,0	51,3	47,7	77,9	88,8	91,9	5,7	16,3	19,5	22,4	0,0	4,0	8,0	9,0
Uganda	8,6	14,6	31,8	42,7	43,9	55,4	56,4	57,5	2,3	4,5	24,4	38,0	1,0	1,0	0,0	0,0
Zambia	20,0	26,4	40,3	39,8	47,1	59,2	75,2	77,2	5,4	4,8	14,0	11,0	14,0	16,0	14,0	13,0
Asia and the Pacific	**33,2**	**58,4**	**85,9**	**83,0**	**79,7**	**90,9**	**98,1**	**95,5**	**20,4**	**45,5**	**80,2**	**77,0**	**10,9**	**17,9**	**26,8**	**29,1**
Afghanistan	2,1	43,2	97,7	98,7	71,9	86,6	99,5	100,0	0,0	29,6	97,1	98,3	11,0	22,0	34,0	37,0
Bangladesh	35,2	59,6	88,0	85,2	77,6	90,2	99,5	97,1	21,7	45,7	81,6	78,3	9,0	13,0	21,0	24,0
Bhutan	40,2	81,8	97,7	100,0	97,1	99,5	99,1	100,0	19,7	72,0	96,8	100,0	32,0	67,0	77,0	77,0
Cambodia	15,5	48,0	89,1	91,6	64,3	93,1	99,1	100,0	4,3	36,3	86,1	89,0	4,0	13,0	20,0	22,0
Kiribati	53,1	77,1	98,6	100,0	89,7	91,9	93,4	93,7	24,8	63,3	100,0	100,0	3,0	3,0	4,0	4,0
Lao People's Dem. Rep.	45,9	70,0	93,6	97,9	96,0	97,3	99,5	99,5	31,0	58,0	90,5	97,1	2,0	4,0	7,0	7,0
Myanmar	43,0	53,8	69,8	66,3	82,6	88,3	92,6	92,2	28,2	39,7	59,9	54,8	3,0	11,0	25,0	28,0
Nepal	24,6	67,3	92,4	93,9	85,7	94,1	97,9	95,8	14,7	61,7	91,1	93,5	8,0	22,0	29,0	29,0
Solomon Islands	7,7	38,1	62,9	66,7	59,4	66,3	73,7	76,7	0,0	30,8	59,6	63,5	9,0	8,0	9,0	9,0
Timor-Leste	25,6	52,5	80,0	85,6	71,7	87,6	99,2	100,0	10,6	38,7	71,7	79,2	2,0	5,0	11,0	12,0
Tuvalu	94,5	97,4	99,9	100,0	95,9	98,7	100,0	100,0	93,3	95,7	99,7	100,0	33,0	41,0	42,0	43,0
Vanuatu	24,1	41,8	62,8	61,9	78,5	85,6	92,4	93,7	8,7	27,5	52,8	51,1	17,0	11,0	8,0	8,0
Yemen	51,2	73,4	79,2	62,0	92,1	99,9	97,7	85,0	36,3	60,8	68,8	48,7	57,0	60,0	61,0	60,0

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VII.

TOWARD A SUSTAINABLE AND EQUITABLE **ENERGY FUTURE**

POLICY BRIEF

THE MULTI-TIER FRAMEWORK MEASURING ENERGY ACCESS: TRACKING SDG 7.1 AND BEYOND

YEARLY UPDATE

Contributing organisations:

The World Bank in cooperation with the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and the International Institute for Applied Systems Analysis (IIASA)

KEY MESSAGES

This year's policy brief presents a yearly update on the Multi-Tier Framework (MTF) country results, the improvements in the methodology, and the different types of insight provided to practitioners and policy makers, as well as plans for new MTF country surveys and research projects that lie ahead.

Country Diagnostic Reports were published in 2019 for six countries, and a second round of MTF surveys has started in another six countries. The MTF questionnaires have been updated, and the computer-assisted personal interviewing (CAPI) data collection method has been improved. An MTF survey guidebook to help practitioners prepare and implement an MTF survey is under development.

MTF data supported World Bank electrification projects in several countries. They were used to better understand the levels of electricity consumption, revise assumptions around electricity demand for geospatial electrification planning, and refine algorithms that allow investigators to map the penetration of solar products. MTF data informed the impact analysis of a tariff increase on households' welfare and estimations of income elasticity of electricity consumption. The Off-Grid Solar Market Trend Report 2020 uses MTF data to estimate the size of off-grid solar markets, understand the role of off-grid solar products in electrification, and assess affordability gaps.

The upcoming The State of Access to Modern Energy Cooking Services 2020 report uses the MTF to define the term modern energy cooking services (MECS) and capture the multi-dimensional nature of energy for cooking—asking, not only if it is clean, but also if it is efficient, convenient, safe, reliable, and affordable. Building on MTF data, the report estimates for the first time the number of people that lack access to MECS globally, beyond the current SDG7.1.2 indicator that tracks the population with access to clean fuels. Also benefiting from the tiered approach in the MTF, the report estimates the number of people globally that are in Tier 3 access (or "in transition") and offers a transition pathway for countries moving toward universal access to MECS by 2030.

The MTF reveals important information on the status of energy access in enterprises and health and education facilities. Results are available in four countries for enterprises and six countries for health and education facilities. Findings show that Reliability, Availability (duration), and Quality (MTF attributes) of the electricity supply impact business profitability. The delivery of health services is also influenced by the poor performance of the electricity supply. Given the current COVID-19 pandemic, a comprehensive and up-to-date assessment of the status of electricity access in health facilities is critical in providing just-in-time support.

New MTF country surveys and data will be available by 2024, and a focus on the energy access status of displaced communities and refugees will be added. Also, the MTF team aims to democratize the MTF surveys and data analysis by streamlining and digitizing the process. In addition, workshops, webinars, and conferences to strengthen the capacity of national statistical offices in energy data collection will be organized.

MTF data are being used to carry out in-depth research on several areas, including the drivers of off-grid technologies, the causality between access to energy and outcome indicators (such as a household's welfare), and the reasons behind very low electricity consumption in grid-connected households. Also, deeper research into gender inequality will be carried out to understand the drivers and differences behind energy access in female- and male-headed households. Finally, MTF data will be combined with satellite imagery to improve estimation of electricity access.

INTRODUCTION

In last year's publication, policy brief #15 presented the Multi-Tier Framework (MTF) as a prominent tool for setting SDG 7.1 targets and tracking progress toward achieving them. The MTF, developed by the World Bank's Energy Sector Management Assistance Program (ESMAP) in consultation with international partners goes beyond the binary measurement of energy access currently used to track SDG 7.1 progress. It offers a clear definition of what affordable, reliable, and modern energy access means, and it proposes measurable indicators for each aspect, as well as a method for combining them into a single indicator to facilitate tracking. The MTF captures the multidimensional nature of energy access at the end-user level, along with the vast range of technologies that can provide such access, while accounting for the wide differences in user experience.

To date, the MTF surveys have been carried out in 16 countries, and surveys are under implementation in 6 more.[1] The MTF data analysis offers useful input for policy formulation, investment strategies, project design, utility performance accountability, and monitoring and evaluation. Last year's policy brief described how the richness of MTF data has been used in several countries, providing valuable market intelligence for the private sector and helping to deepen sector dialogue with governments and inform policies and investments to meet ambitious access targets. This year's policy brief presents an update on the MTF country results and improvements in methodology, the different types of insights provided to practitioners and policy makers, and plans for new MTF country surveys and research projects that lie ahead.

2019 UPDATE

Country Diagnostic Reports were published in 2019 for Bangladesh, Kenya, Myanmar, Nepal, São Tomé and Príncipe, and Zambia. The second round of MTF surveys has also started, covering Burkina Faso, Burundi, Cameroon, Malawi, Sierra Leone, and Zimbabwe. MTF questionnaires have been updated to incorporate lessons learned from the first round of surveys. The CAPI data collection method used in the first round of MTF surveys has also been improved. The MTF team has collaborated with the Living Standard Measurement Study (LSMS) team to design the CAPI program. The CAPI script will be used consistently in all the new countries, facilitating data management. In addition, the MTF team is working with LSMS and World Health Organization (WHO) teams to develop the MTF Survey Guidebook to help practitioners prepare and implement an MTF survey. The guidebook is expected to be published in 2020.

The MTF data are informing World Bank-funded electrification projects in several countries. In Uganda, the government and the World Bank project team are using the MTF dataset to better understand the levels of electricity consumption among grid-connected households. Such information will help revise assumptions on electricity demand for the geospatial electrification planning exercise that is being carried out. In Ethiopia, MTF data are being used to further refine algorithms that will allow investigators to map the penetration of solar products at the micro level, down to the square mile. Also results from the MTF module on Willingness to Pay for solar solutions will feed into an affordability assessment. In Nepal, MTF data were used to prepare the First Programmatic Energy Sector Development Policy Credit Project (World Bank 2018). Data on grid access, electricity consumption, and expenditure informed the impact analysis of a tariff increase on households' welfare. In addition, MTF data contributed to observing a leakage of subsidies to the non-poor. The project team also used the data to estimate income elasticity of electricity consumption, while controlling for electricity price and household demographic and location

1 For all documents related to MTF country surveys, please go to https://energydata.info.

characteristics.

The Off-Grid Solar Market Trend Report 2020 (Lightening Global Program 2020) used MTF data available in eight countries to estimate the size of the off-grid solar market, understand the role of off-grid solar products in electrification, and assess affordability gaps.[2] MTF survey results helped estimate the market size of off-grid solar products by capturing not only "plug-and-play" products (all-in-one packaged kits) but also component-based solar products. The latter are difficult to capture through product sales information from off-grid solar companies. In addition, socioeconomic indicators, such as a household's total expenditure (a proxy of household's welfare level) and expenditure on specific energy sources, contribute to our understanding of the affordability gap that end-users face.

The MTF for measuring access to cooking has been used to conceptualize the Modern Energy Cooking Services (MECS) program, a multi-year £40 million UK Aid–funded program launched in April 2019 and jointly implemented by Loughborough University and ESMAP. The MECS program is implementing a strategy focused on including the cooking needs of households into investment decisions on "access to affordable, reliable, sustainable modern energy for all," with a strong emphasis on innovation in technology and business models (MECS 2020). The MTF has been used as the basis for defining access to MECS that goes beyond the binary indicator that tracks the population with access to clean fuels. The forthcoming *The State of Access to Modern Energy Cooking Services 2020* report uses the MTF to define the term MECS and capture the multidimensional nature of energy for cooking—asking, not only whether it is clean, but if it is efficient, convenient, safe, reliable, and affordable. The report also goes beyond fuel type and stove ownership to explore MTF data on stacking behavior, time spent by household members collecting fuel and cooking, the incidence of accidents and injuries, as well as affordability and availability of the fuel. Building on the existing MTF data collected, the report estimates for the first time the number of people that lack access to MECS globally, beyond the currently used binary indicator that tracks the population with access to clean fuels. It complements the current SDG7.1.2 indicator and offers more insights into user preference and key dimensions for sustainable adoption, which have direct implications for rethinking the overall cooking ecosystem. Also benefiting from the tiered approach of the MTF, the report estimates the global number of people that are in Tier 3 access (or "in transition") and offers a transition pathway for countries moving toward universal access to MECS by 2030, by considering country-specific contexts and taking a "least cost, best fit" approach. The results of the MTF cooking analysis also underscore the need for greater focus on investment and policy in the sector. It has been used as a basis and reference for designing the US$500 million Clean Cooking Fund established by ESMAP (World Bank 2019).

MTF data on enterprises reveal important information on the energy situation that enterprises face in each country and can inform better targeted interventions on productive uses of energy. MTF surveys were carried out in four countries between 2017 and 2018.[3] The MTF enterprise survey in São Tomé and Príncipe showed, for example, a stark difference in electricity access between formal and informal enterprises. About 86% of formal enterprises have access to electricity, versus 37% of informal enterprises.[4] Access to electricity is also higher among nonmanufacturing enterprises compared to manufacturing ones.[5] The grid is nearly the only source of electricity: only about 2% of formal enterprises reported using an off-grid solution as their primary electricity source. Access to the grid is seen as a game changer in terms of productivity, particularly among formal enterprises: if they had a grid connection, they would use more appliances and extend their operating hours. Grid-connected enterprises face challenges with the Reliability, the Availability (duration), and the Quality

2 This biennial flagship report is published by the World Bank Group's Lighting Global Program in cooperation with the Global Off-Grid Lighting Association, with support from ESMAP. The eight countries are Cambodia, Ethiopia, Kenya, Myanmar, Nepal, Rwanda, São Tomé and Príncipe, and Zambia.

3 India, Kenya, Nepal, and São Tomé and Príncipe.

4 The MTF survey in São Tomé and Príncipe surveyed 300 formal enterprises and 300 informal enterprises around the country. Formal enterprises are businesses that are officially registered with the appropriate authorities in São Tomé and Príncipe, while unregistered enterprises constitute the informal sector.

5 Manufacturing enterprises refer to those in the International Standard Industrial Classification (ISIC) sections B to F, including carpentry, mining, electricity distribution and supply, and construction sectors. Nonmanufacturing enterprises include ISIC sections G to U, including retail, telecommunications, and financial sectors.

of the electricity supply.[6] This impacts their profitability and their business expansion potential, as they often must spend additional resources to use backup electricity sources and stabilizers.

The MTF survey has also been carried out in health and education facilities, and results are available in six countries.[7] Given the current COVID-19 pandemic, a comprehensive and up-to-date assessment of electricity access status of health facilities is critical in providing just-in-time support. In Niger, MTF data show that 52% of the health facilities are electrified via off-grid solutions (mainly solar devices and rechargeable batteries), while 28% are connected to the grid.[8] The remaining 20% have no access to any electricity source. Health facilities have backup solutions to address their needs during power outages—mainly diesel generators and rechargeable batteries. The most common appliances are lights, fans, and vaccine refrigerators. Limited availability and reliability of electricity supply impact the delivery of health services, and most health facilities are required to limit working hours. Also, about 4 in 10 facilities must limit the usage of medical devices due to electricity supply issues.

When looking at education facilities in the country, 90% are connected to the grid, while 10% use off-grid solutions such as solar devices and rechargeable batteries. Education facilities mainly use electricity for lighting, televisions, and computers.

GOING FORWARD

New MTF country surveys and data will be available by 2024 to help governments and practitioners understand energy access status, identify bottlenecks, and make informed decisions for achieving universal access goals. Following the second round of surveys planned in 2020–21, additional MTF surveys will be carried out in new countries in the following four years. In addition, the MTF survey will be conducted among refugees and displaced communities in several selected countries to understand their status of energy access.

The MTF team aims to democratize the MTF surveys and data analysis by streamlining and digitizing the process—from preparation and implementation to data analysis and visualization. In addition, the MTF survey has been structured by module, making it possible for practitioners to carry out only parts of the survey or add modules (such as an energy-efficiency survey module) if desired, using the CAPI script provided. The upcoming survey guidebook will include the MTF questionnaires and CAPI script. The MTF team in collaboration with the LSMS and WHO teams also plans to organize workshops, webinars and conferences to strengthen the capacity of national statistical offices in energy data collection. Mainstreaming MTF data collection through the national statistical systems will enable better tracking of SDG7.1 and inform design and implementation of energy policies and planning toward meeting the SDG7.1 targets.

MTF data will be used to carry out in-depth research in several areas. Following MTF data results in Myanmar, the World Bank energy team is planning to look further into MTF data to investigate the drivers of off-grid technologies and understand low uptake in villages. Moreover, the Myanmar team will use MTF data to explore the causality between access to energy and outcome indicators, such as a household's welfare (measured through a household's expenditure or consumption). In Kenya, the World Bank energy team will use MTF data to investigate household electricity demand to understand the reasons for very low electricity consumption in recently connected households and identifying ways to promote productive use of electricity.

Deeper research into gender inequality will be carried out to understand the drivers and differences behind energy access in female and male-headed households, which will enable the formulation of evidence-based recommendations to policy makers

6 For the definition of Reliability, Availability, and Quality of supply (attributes of MTF), please refer to the 2019 Policy Brief #15.
7 Cambodia, Ethiopia, Kenya, Myanmar, Nepal, and Niger.
8 The MTF survey in Niger covered 23 health facilities and 92 educational facilities.

and practitioners. Current gender analysis available in the MTF Country Diagnostic Reports—based on the gender of the household head and in some cases on the gender of the household members—helps shed light on some of the dynamics between women and men in terms of both access to electricity and modern energy cooking solutions.[9] For example, female-headed households generally show lower willingness to pay for a grid connection, a solar device, or a cookstove. However, descriptive statistics and simple conditional averages are not enough to interpret findings from a gender point of view. In terms of access, gender gaps vary by country. Female-headed households may show poorer access compared to male-headed households in some countries, similar access in others, and better in others. Similarly, mixed results also appear when looking at access in urban and rural areas. Thus, the analysis of access by gender of the household head is a complex task, with multiple factors coming into play, such as household expenditure levels or whether a household is located in an electrified community. To this end, a comprehensive research design will be developed to identify the factors that account for divergences between men and women.

MTF data can also be combined with satellite images captured at night to improve estimation of electricity access.[10] Night-time lights imagery can estimate emitted light or brightness with a resolution of around 500 meters, and thus confirm regions of access. By overlaying population data, it is possible to estimate the share of electrification within each area, thereby complementing end-user data such as MTF survey data. Georeferenced data points in the MTF survey can help validate the model's predictions by calibrating, for example, the threshold of brightness determining the electrification status of a cell. Moreover, night-time lights imagery can help in the sampling process of the MTF survey, in particular the stratification strategy. Analysis of satellite imaging can reduce the lag in tracking the progress of electrification, particularly in fragile and conflict-affected countries where household surveys and censuses are conducted infrequently and irregularly, leaving substantial gaps in data. Recent efforts to overlay night-time lights imagery with other publicly available satellite-derived data sources on population and land cover provided a valid and complementary source of easily reproducible and updatable data to support tracking efforts in regions where surveys are difficult and conducted infrequently (Falchetta et al. 2019). Such datasets offer important insights into the wide inequalities in the extent of electrification at a subnational scale, and can also help reveal inequalities with regard to the performance of the electricity supply (Falchetta et al. 2020).

Finally, there are also efforts underway to simplify and conceptually enhance the MTF by the use of alternative measurement frameworks (Pachuri and Rao 2020). Such alternative frameworks provide a simplified set of indicators that more closely align with energy services and the impact that access to such services has on well-being. Application of such an alternative framework to MTF datasets from Ethiopia and Rwanda suggest that it better reflects the heterogeneity among the "energy-poorest" households. Further refinements and applications of such alternative frameworks can help improve how the most vulnerable are identified and help design and target policies to improve energy access for all.

9 Gender-disaggregated results are presented for a series of indicators, such as access to electricity, access to cooking solutions, ownership of appliances, willingness to pay, time use, and decision making.

10 Limitations of night-time imagery include coarse resolution, regional differences, and granularity limited by the amount of light that can be picked up from space. Satellite sensors may not be able to pick up light emitted from houses or offices. Off-grid sources may be particularly hard to capture because of dimmer light.

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POLICY BRIEF

THE ROLE OF ENERGY SCENARIOS IN GUIDING THE ENERGY TRANSITION

Contributing organisations:

PBL Netherlands, Ministry of Foreign Affairs of the Netherlands, International Renewable Energy Agency, the World Bank, International Institute for Applied Systems Analysis, Ministry of Climate, Energy and Utilities of Denmark, United Nations Economic and Social Commission for Asia and the Pacific.

KEY MESSAGES

Long-term energy scenarios are fundamental tools for guiding clean energy transition policies and financing. They can lay the foundations for identifying potential targets, trade-offs and synergies, as well as investment strategies at the national, regional and global level.

Besides analysing energy sector trends and options, energy transition scenarios can also demonstrate the multiple additional socioeconomic and environmental benefits of green economic recovery strategies. This is an important perspective to keep in mind as decisions are made during the current COVID-19 crisis. Long-term energy transition scenarios can provide essential guidance related to short-term crisis responses of policy makers and financial institutions, while also looking towards increased resilience, new jobs, energy security and environment sustainability in the long run.

A set of key principles should be observed for developing effective energy scenarios to guide policy for the energy transition:

• Invest in the development of clean energy transition scenarios, and build the capacity to prepare them;

• Set clear objectives for scenarios, aligning them with the SDGs and the decarbonisation goals of the Paris Agreement;

• Ensure a participatory and inclusive scenario-building process involving all stakeholders.

The development context matters. Energy scenarios are powerful tools to explore potential energy pathways to achieve the SDGs and the objectives of the Paris Agreement. However, they must be framed within appropriate socioeconomic narratives, and account for new technologies, business models and disruptive innovations

INTRODUCTION TO ENERGY SCENARIOS

Long-term energy scenarios are fundamental tools for energy policy making. Many countries also use them as the basis for investment strategies and targets applied at the national or regional level. International organisations, associations, companies and other institutions produce global scenarios to inform global policy debates, and there are a number of research institutions that produce various scenarios as a part of scientific exercises to inform these debates.

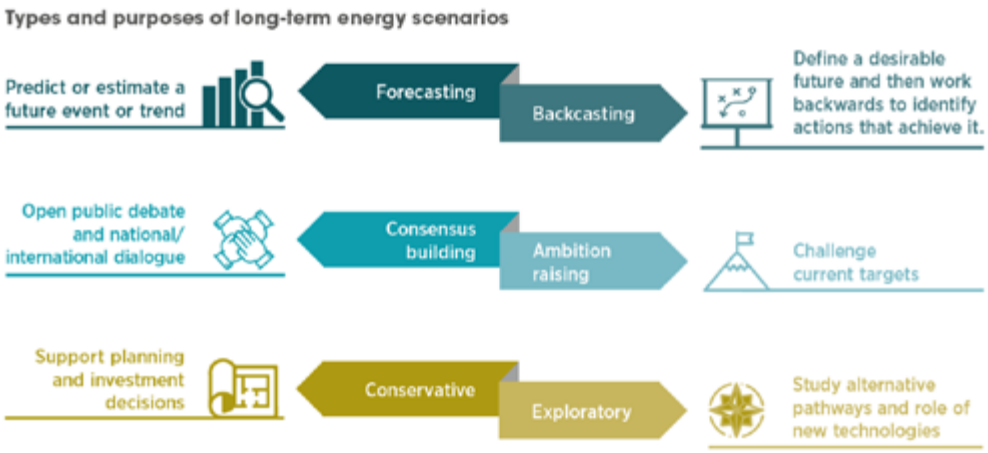
Model-based scenarios are powerful tools for exploring potential pathways to achieve the Sustainable Development Goals (SDGs) and the objectives of the Paris Agreement. They provide information for decision-making processes, and also provide insights on important synergies and trade-offs between the various goals.

A number of international organisations and companies, such as IEA, IRENA, BP, Shell, along with several research organisations, have developed and assessed scenarios to explore possible energy transition pathways. These scenarios provide input for target-setting and policy interventions in the energy system.

However, the various, and often conflicting, interests and methodologies used by these organisations cause the interpretation of the scenarios to be challenging. Establishing the purpose of particular long-term scenarios, and communicating the objectives clearly to all stakeholders, is key to effective policy making.

Traditionally, energy scenarios have been developed to focus on forecasting for the power sector. However, in the context of SDG 7 and the Paris Agreement, a holistic, 'backcasting' approach is required, which involves envisioning a desirable future and then planning how that could be achieved, taking into consideration the full energy system and how it relates to SDG 7 issues, emission reductions and other sustainable development goals.

The International Renewable Energy Agency (IRENA) has coordinated a campaign to improve the use and development of long-term energy scenarios for the clean energy transition (LTES Campaign)[1]. Discussions held with multiple stakeholders have shown that scenarios can be divided into different categories according to their purpose:



• **Forecasting or backcasting.** For policy making, scenarios often use backcasting to identify actions and policies that can help navigate pathways to a desirable future (e.g. the Paris Agreement). This should not be confused with forecasts, which tend to be extrapolations of recent trends without exploring alternative courses of action.

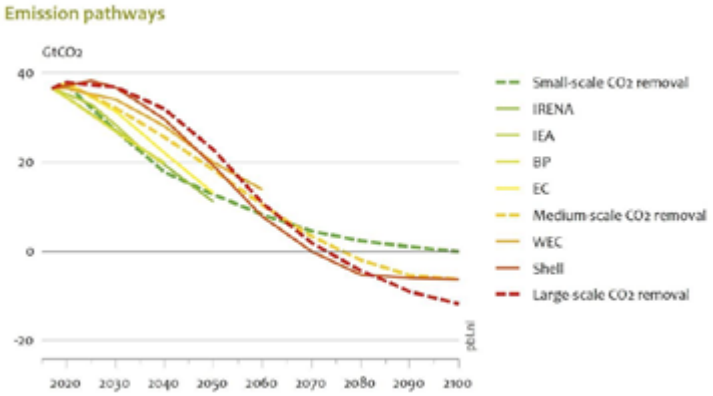
• **Consensus building or ambition raising.** Scenarios can be used to open public debates and international dialogues to bring stakeholders together to agree on how the future should look, with the aim of developing feasible pathways. In a more agenda-driven context, scenarios are used to challenge current targets, for instance aiming for 100% renewables in a system or drastic demand reductions to speed up the transformation.

1 https://www.irena.org/publications/2019/May/LTES-First-year-campaign-findings

• **Conservative or exploratory.** While scenarios need to be realistic to be used as a basis for informing and supporting decisions, some governments, research institutes and academics use scenarios to explore more radical changes in order to prepare for uncertainties. These scenarios may, for instance, study the role of new technologies that are still in the development stage, or consider disruptive behaviour changes.

Box 1 - Comparison of 2oC scenarios by PBL Netherlands Environmental Assessment Agency

PBL compared the similarities and differences between 2 °C scenarios developed by Shell, BP, the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA), the World Energy Council (WEC), the European Commission (EC) and the 2°C scenarios assessed by the IPCC, with a focus on main transition indicators to identify the key near-term factors consistent with a 2°C transition.



The 2°C scenarios analysed strongly differ with respect to the timing of emission reductions. The scenarios by IRENA and IEA are characterised by immediate, rapid CO2 reductions mainly achieved through large energy efficiency improvements and strong scaling up of renewable energy. These scenarios avoid being strongly dependent on technologies that lead to net removal of CO2 from the atmosphere. The scenarios by Shell and WEC show more gradual emission reductions, relying heavily on CO2 removal in the second half of the century to compensate for the excess in emissions.

Regardless of the timing of emission reductions, all scenarios agree on a rapid phase-out of the use of coal, a strong increase in renewable energy, and a fast electrification of the economy. The phasing out of coal is relatively slow in the Shell and WEC scenarios and relatively fast in the IRENA and BP scenarios. Renewable energy shows a faster increase in the IRENA, IEA, BP and Shell scenarios than those presented by IPCC. For natural gas use, IRENA and EC show very small increases by 2030, while the use of natural gas in the scenarios by BP and Shell increases more substantially.

[https://www.pbl.nl/en/publications/insight-into-energy-scenarios]

Best practices in energy scenarios

Key recommendations to improve the development of clean energy transition scenarios to support policy making:

1. Clearly identify who is involved, what questions they need to answer, and what their role is in the planning process for the clean energy transition.

2. Expand the boundaries of the scenarios to adequately reflect the complexities of the clean energy transition. Models and scenarios need to be framed within rich socioeconomic narratives and account for new technologies, business models and disruptive innovations that will enable higher shares of variable renewable energy, electrification and sector coupling.

3. Establish a strong governance structure for the development process of clean energy transition scenarios. A participatory process and strengthened inter-institutional co-ordination between bottom-up regional governance with top-down planning and policy making fosters trust and benefits the scenarios' legitimacy, and can help ensure a just transition.

4. Be transparent and explore effective scenario communication methods. Scenario assumptions and results need to be publicly available[2] to increase transparency, facilitate scrutiny, and increase usefulness to other researchers and policy makers.[3] It is important

2 FAIR data principles: Findable, Accessible, Interoperable, Reusable https://www.go-fair.org/fair-principles/

3 For example, the IAMC 1.5C Scenario Explorer publicly hosts all the emissions scenarios used in the IPCC Special Report on

to present scenario results in a manner easily understood by society at large.

5. Build scenario capacity in energy ministries, and other government institutions or technical institutions, to better understand and explain models, and to provide continuity and consistency of results and scenario updates over the long term. This is essential when considering the rapidly-changing energy landscape and technologies.

From scenarios to energy transition policies

Scenarios can be used to develop the visions required to design effective energy transition policies. Such visions are needed to explicitly define the desired overarching transition objective. Visions do not say how to get to a certain objective, but they aid in formulating more concrete goals and targets to pursue. Design principles for such visions include long-term robustness and resilience.

For scenarios to be useful for policy makers in implementing appropriate policies, a deep dive into the energy system is necessary, for example, by analysing energy demand and supply at the sectoral, subsectoral and end use levels. This increases the potential for policies to deal with uncertainty and disruptions, thereby making sudden unexpected effects easier to withstand. Transitions are helped by an integrated approach to policy implementation, across themes and sectors, and across various levels of government, along with mobilisation of all types of actors.

As transitions normally involve winners and losers, the social dimensions of environmental policies warrant special attention. Scenarios alone do not provide enough information to know which mechanisms can be incorporated. Stakeholder participation in decision making can help to ensure that transition policies reflect a broad range of interests and minimise trade-offs. The distributional effects of transitions can be addressed through social safety nets and other mechanisms that specifically support vulnerable groups.

Scenarios can also be used to explore the feasibility of transitions and interactions that are not explicitly integrated into scenario models, by matching the models with bottom-up analysis, thereby achieving more granularity in the assessment of trade-offs, and also opening opportunities to identify entry points.

From national scenarios to financing

Many scenario assessments explicitly discuss the role of finance and the financial sector. The financial sector is considered to have substantial leverage over the actions of other actors, as well as potentially playing an active role in making finance more accessible for context-specific actions requiring policy coherence and integration. .

On a national and regional level, proper planning and robust scenarios reduce uncertainties for the selection of projects, facilitate financing by providing confidence to investors, and reduce processing times for projects. Ultimately, appropriate planning and scenarios can lead to stronger and faster mobilisation of resources channelled into the energy transition, and an earlier achievement of sustainable energy policy targets.

National decision makers need national scenarios to support regulatory changes or the creation of national targets, such as carbon emission reduction trajectories, or the share of variable renewable energy (VRE) in the energy mix. For example, the World Bank recently supported a planning and VRE integration study in Pakistan, conducted jointly by international consultants and Pakistan federal agencies. This study, which was undertaken alongside an energy policy review by the newly-elected government, was instrumental in giving the government and key supporting agencies the comfort they needed for setting VRE integration targets (20% VRE by 2025 and 30% by 2030).

Also, for countries with less carbon-intensive domestic resources, national pathways are useful to achieve an effective allocation of scarce resources, and to understand and overcome the trade-offs that sometimes exist between access ambitions and decarbonisation goals. In the power sector, Master Plans or Integrated Resource Plans that give clear indications of the short-term and medium-term investments needed to meet access and climate targets provide a strong signal for investors, MDBs and other climate financing institutions. National pathways will inform Nationally

1.5C. All data is available for download and interactive visualisation. https://data.ene.iiasa.ac.at/iamc-1.5c-explorer

Determined Contributions to the Paris Agreement on climate change.

Scenarios are also pivotal in achieving energy access targets and planning for energy sector development to tackle energy poverty. This pertains to central grid extension as well as to decentralised electrification options for areas and population groups currently without decent electricity access.

Integrated scenario development and assessment of synergies with other sectors can help with prioritising investments. Clean cooking solutions have relatively low investment costs, but large positive impacts on health and well-being through reduced indoor air pollution. The impacts of environmental change on energy supply are also crucial for long-term financing decisions (e.g. the impact of climate change on hydropower generation).

From global scenarios to financing

Global scenarios can be used to achieve the most effective allocation of global investment resources, especially considering the availability and importance of multilateral financing mechanisms. Green investment is becoming a prerequisite for funding energy projects by most development banks and private sector financiers. Robust energy scenarios can provide information about the long-term viability of sustainable energy projects and the need to redirect financing from fossil fuel assets into clean energy infrastructure.

Even in the shorter term, target scenarios are useful to assess the challenges that lay ahead, particularly the financing challenges. For example, according to the Transforming Energy Scenario from IRENA's Global Renewable Outlook 2020, which describes the path needed to keep the rise in global temperatures to below 2°C, 3227 GW of solar power and 2526 GW of wind need to be installed by 2030. This represents another 2645 GW for solar and 1902 GW of wind installation above today's installed global capacity.

Various scenarios indicate that cumulative investments in the order of US$ 10 trillion should be redirected from fossil fuels and related infrastructure to low-carbon technologies by 2030 to keep within the 2oC target.[4] Cumulative investments in the energy system over the period to 2030, including infrastructure and efficiency, would need to reach US$ 60 trillion. Nearly US$ 9.6 trillion of cumulative investments would be needed to scale up renewable power generation capacity through 2030. In annual terms, this would require doubling investments in renewable power generation capacity to US$ 676 billion per year until 2030 compared to US$ 289 billion invested in 2018.

In the Asia-Pacific region, it is estimated that an annual additional investment of about US$ 385 billion would be needed to achieve SDG 7 and the Paris Agreement by 2030. Most of this investment gap can be closed by putting a price on carbon and phasing out fossil fuel subsidies and investing back into renewables.[5]

While the proportion of solar and wind generation is rising every year, it is still far from the scale needed. The World Bank, in partnership with AFD, IRENA and ISA, has therefore taken the initiative to ensure that investment barriers will be lifted through the Sustainable Renewables Risk Mitigation Initiative (SRMI), which is designed to help governments attract the private sector. Another example is the Climate Investment Platform (CIP) organised by IRENA, UNDP, SEforAll and the Green Climate Fund, which aims to connect low-carbon energy projects with available climate finance to advance the global energy transformation and support the implementation of ambitious NDCs. Similar initiatives have been undertaken to address the identified financing needs in the fields of electricity access and clean cooking.[6]

4 https://www.nature.com/articles/s41560-018-0179-z/

5 https://www.unescap.org/publications/energy-transition-pathways-2030-agenda-asia-and-pacific-regional-trends-report-energy

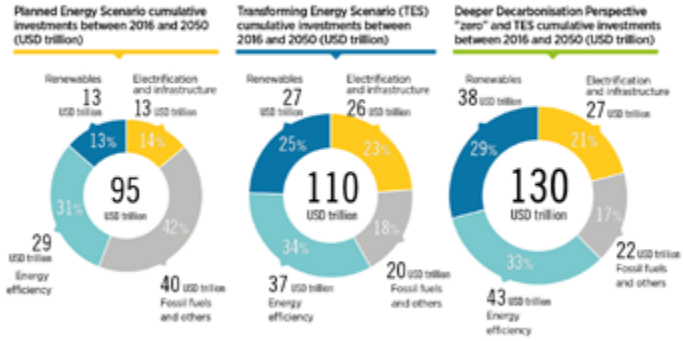
6 Cameron et al https://doi.org/10.1038/nenergy.2015.10 and Pachauri et al https://doi.org/10.1371/journal.pone.0197974

Box 2. Quantification of investment needs

The IRENA Global Renewables Outlook presents energy transition scenarios, together with their implications for financing.

According to current plans and policies, US$ 95 trillion worth of energy investments are estimated to be needed globally until 2050. However, a climate-safe future calls for the scale-up, and redirection, of investments to clean energy technologies. Under a Transforming Energy Scenario, total investments would need to reach US$ 110 trillion by 2050, of which 80% needs to be invested in renewables, energy efficiency, end-use electrification, and power grids and flexibility, to limit global warming to below 2oC. The Deeper Decarbonisation Perspective would require additional investment of US$ 20 trillion to limit global warming to well below 1.5oC by mid-century.

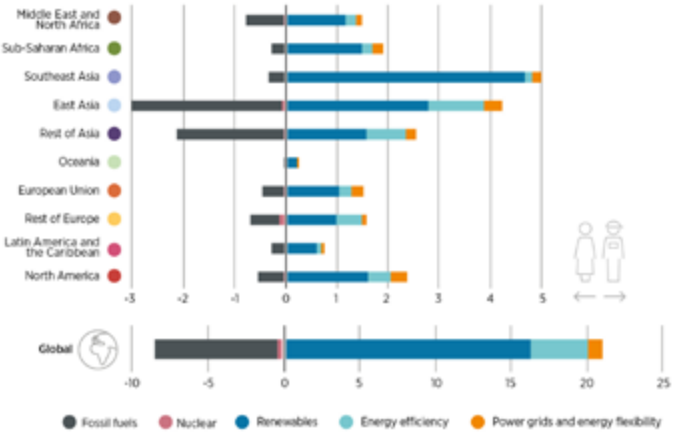
Figure S.8. New investment priorities: Renewables, efficieny and electrification of heat and transportation



The scenarios have been designed to demonstrate that the payback for accelerating renewables deployment and efficiency measures is many times larger than the costs. The Transforming Energy Scenario would boost global GDP in 2050 by 2.4% compared to the Planned Energy Scenario. The cumulative gain from 2019 to 2050 would amount to US$ 98 trillion. While economy-wide employment would increase by 0.15% (6.5 million more jobs) in 2050, the energy jobs overall would reach 100 million by 2050, about 40 million more than today. The job gains from transition-related technologies (renewable energy and energy efficiency) would outweigh the losses in conventional energy jobs (fossil fuels and nuclear energy) in all regions. Importantly, environmental and health benefits, along with broad improvements in people's welfare, would be felt in every region of the world, primarily due to lower air pollution.

Figure S.13. Energy sector job gains: Exceeding losses in every region

Difference in energy sector employment in 2050 between the Transforming Energy and Planned Energy scenarios, by region and sector



[Source: IRENA Global Renewables Outlook 2020]

Scenarios and crisis

The impacts of COVID-19 on the global economy and the resulting fall in oil prices in early 2020 serve as reminders of how unforeseen factors can disrupt both actual trends and planned processes. These developments confirm the importance of close interconnections between the energy system and the wider economy.

The health, humanitarian, social and economic crises set off by the current COVID-19 pandemic could either slow or accelerate transition pathways of our societies. Much will depend on how countries respond in terms of economic stimulus. The COVID-19 crisis has triggered the preparation of vast economic incentive packages, possibly the largest structural economic investment in decades. There is a serious risk that some countries may see conventional energy investments as a more attractive route to recovery than energy transition.

Scenarios can demonstrate the superior socioeconomic and environmental outcomes of targeting sustainable energy transition pathways in terms of investment and job creation opportunities, and resulting increased resilience of the population and the economy. They can also expose the risks of stranded assets, and inform policy makers as to which policy options and criteria they can apply to build back better.

Existing scenarios developed before the COVID-19 crisis could guide policy makers during these uncertain times and allow them to make informed choices and necessary reforms to ensure a sustainable recovery. Recent evidence showing that people exposed to air pollution are more likely to die from COVID-19 than people living in areas with cleaner air, increases the urgency to expand access to cleaner cooking options to avoid the serious health impacts associated with poor indoor air quality.[7] Further scenario development can policy makers pursue the aim of the greater ambition and a better recovery.

The Transforming Energy Scenario prepared by IRENA shows how to achieve stable, climate-safe, sustainable long-term energy and economic development. The Deeper Decarbonisation Perspective could guide low-carbon policy measures, helping to ensure coherence between rhetoric and action in tackling climate change.

In the Asia-Pacific region, UN ESCAP is supporting policy makers by developing scenarios that examine various deep decarbonisation pathways at the national level. These include phasing out fossil fuel power plants by 2030, both with and without fossil fuel subsidy reform, and raising ambitions on NDCs by aligning them with the 1.5oC pathway.

During the urgent medical crisis, the immediate energy priority is to ensure energy access for health and sanitation services and to support utilities and essential electricity providers to ensure service continuity, avoiding shut offs of the poorest and most vulnerable consumers. The next step will be to ensure that we are building momentum for a better recovery.

In Sub-Saharan Africa, rapid headway with modular solar and battery storage will empower clinics to mitigate current COVID-19 impacts. Investing in all supply options – grid expansion, mini-grids and off-grid solar – will also be critical. Those projects are labour intensive, which will help put the country on a rapid economic recovery trajectory, and will increase the system resilience while lowering its vulnerability to oil price volatility.

The COVID-19 crisis, coupled with the current low oil prices, presents both risk and opportunity. Without leadership, economic recovery packages may be directed back into supporting unsustainable and carbon-intensive industries, thereby locking in emissions and closing the window of opportunity to keep global temperatures within safe limits.

However, this crisis could also provide a new opportunity to redirect fossil fuel subsidies towards the deployment of solutions like distributed PV or energy efficiency for the residential sector and public facilities. These solutions increase resilience, create new jobs, and improve energy security and environment sustainability. Sustainable scenarios could guide policy makers during these uncertain times and allow them to make informed choices and fiscal reforms that contribute directly to a sustainable recovery.

Experiences of LTES campaign participating countries:

Brazil

Under the co-ordination of the Ministry of Mines and Energy, the Energy Research Office (EPE) published the National Energy Plan to 2030 based on LTES developed by in-house modelling teams at EPE. EPE is currently developing the national energy plan to look further forward to 2050.

Canada

The National Energy Board (NEB) publishes Canada's Energy Future based on LTES, while Environment and Climate Change Canada (ECCC) publishes LTES for both international and domestic reporting purposes. Both the NEB and ECCC have in-house modelling

7 https://news.trust.org/item/20200415095636-jhr36

teams. These activities are supported by data from Statistics Canada and Natural Resources Canada (NRCan).

Chile

The Ministry of Energy publishes a long-term energy planning document every five years with a 30-year time horizon, based on LTES developed by in-house modelling teams.

Denmark

The Danish Energy Agency (DEA), a government agency under the Ministry of Energy, Utilities and Climate, annually publishes the Danish Energy and Climate Outlook and the Power and Gas Infrastructure Outlook based on LTES developed by its System Analysis Department. The System Analysis Department also produces the National Energy and Climate Plan requested by the European Union.

Finland

The energy and climate strategy in Finland up to 2030 was developed by cross-ministry joint work and supported by LTES modelling teams from the VTT Technical Research Centre of Finland and four other research organisations. LTES play an important role in the forthcoming Long-term Energy and Climate Strategy of Finland, which seeks to formulate sustainable pathways to carbon neutrality.

Germany

The Federal Ministry for Economic Affairs and Energy (BMWi) and the German Environmental Agency (UBA) use various LTES procured from research institutions. These LTES usually reflect the renewable energy-related targets of the Energy Concept 2010. The Federal Network Agency (BNetzA) uses LTES as a starting point for transmission grid planning.

Italy

Energy Services Managers (GSE) is state-owned and promotes Renewable Energy Sources (RES) through incentives and information campaigns, as well as carrying out sector studies to support public administrations – their scenario analysis provides insight to Italy's National Energy Strategy.

Japan

The Ministry of Economy, Trade and Industry (METI) co-ordinates the development of the Strategic Energy Plan, which comprises LTES for 2050 using inputs from the expert panel appointed by the government and considering the energy mix from the outlook for 2030.

Mexico

The Federal government has published the National Energy Strategy, in which the vision for 2050 is established based on LTES with 15- and 30-year time horizons developed by in-house modelling teams at the Mexican Secretariat of Energy (SENER).

The Netherlands

The Netherlands Environmental Assessment Agency (PBL) publishes the Dutch National Energy Outlook, providing four Ministries (Economic Affairs and Climate; Interior; Infrastructure and Water Management; and Finance) with LTES developed by in-house modelling teams. From 2019 onward, this Outlook will be renamed the 'Climate and Energy Outlook' and will have legal status as reference for policy progress as stated in the new Climate Law.

Saudi Arabia

The Ministry of Energy oversees energy policy to en-

sure the Kingdom of Saudi Arabia has a sustainable energy mix throughout the clean energy transition. This includes much investment in the Renewable Energy which is enveloped by the long-term strategy: National Renewable Energy Program (NREP).

United Arab Emirates

The Ministry of Energy and Industry (MOEI) launched the National Energy Strategy 2050, informed by LTES developed by in-house modelling teams. It has developed the Future Lab to communicate LTES results to high-level political leaders.

United Kingdom

The Department for Business Energy and Industrial Strategy (BEIS) maintains a national energy system model with a 2050 planning time-horizon in close co-operation with academia to inform policy development – the Clean Growth Strategy is a good example.

REFERENCES AND FURTHER READING

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A more holistic approach to decarbonising society, including how governments can support electrification of end-use sectors by working across government and industries: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_RE-Electrification_SGCC_2019_preview.pdf

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POLICY BRIEF

POLICIES FOR INCREASED ENERGY ACCESS IN DISPLACEMENT SETTINGS[1]

Developed by:

The International Organization for Migration (IOM) as co-chair of the Policy, Advocacy and Host Communities Working Group of the Global Plan of Action for Sustainable Energy in Displacement Settings (GPA) and the United Nations Institute for Training and Research (UNITAR) as the host of Global Plan of Action for Sustainable Energy in Displacement Settings (GPA) Coordination Unit

In coordination with:

The United Nations High Commissioner for Refugees (UNHCR), GIZ, World Food Programme (WFP), the Food and Agriculture Organization of the United Nations (FAO), Chatham House, Practical Action, UNEP-DTU, the United Nations Development Programme (UNDP), the Clean Cooking Alliance, MercyCorps and Sustainable Energy for All.

1 The first part of this paper was written by Suzanna Huber (GPA Coordination Unit at the United Nations Institute for Training and Research) and Eva Mach (International Organization for Migration). It was originally published in Nature Energy – Energy in Humanitarian Contexts as Policies for increased sustainable energy access in displacement settings in 2019. The special 'focus' issue of Nature Energy contributed to the Energy and Infrastructure track of the first Global Refugee Forum. The full publication can be accessed online: https://www.nature.com/articles/s41560-019-0520-1.The opinions expressed in this publication are those of the authors and do not reflect the views of the United Nations Institute for Training and Resarch (UNITAR), the International Organisation for Migration (IOM), or any other UN body. The designation employed and the presentation of the material in this publication do not imply the expression of any opinion on the part of UNITAR or IOM concerning the legal status of a country, city or area or its authorities or concerning the delimitation of its frontiers or boundaries.

KEY MESSAGES

Current energy practices in situations of displacement are often inefficient, polluting, unsafe, expensive and inadequate for displaced people, harmful to the surrounding environment, and costly for implementers. To change this situation and achieve SDG 7 in displacement settings, a conducive policy environment is essential on global, national and agency levels.

Displaced people are unlikely to be included in national or international plans designed to scale up energy access. This is partly because displacement is often considered temporary without the need to establish permanent infrastructure. Often, displaced people live in isolated areas or informal settlements, designated as temporary, alongside others who are also marginalized. Even if they can return home, they often remain in fragile post-conflict, post-disaster situations with limited access to energy.

Moving forward, the following three pillars should form the foundation for the efforts to increase energy access in displacement settings:

Increase data availability and harness better data:
Research and data collection are key to develop a baseline for energy access globally as well as to translate the data collected into useful information, aiding the design of energy access projects with evidence. Including displacement considerations in current energy policies and frameworks is needed to allow and drive effective data collection in line with a harmonized national and/or global framework. Policies that encourage fit-for-purpose data base building and evidence-based interventions are key to advance the GPA agenda at a larger-scale.

Operationalize innovative finance:
Mapping and developing alternative finance models besides traditional grant funding is vital to turn the vision of SDG 7 in displacement settings into reality. Recognizing that energy is one of the few areas in humanitarian response that represent viable business opportunities for private sector actors to engage in, policy discussions – both internal policies of stakeholders and external policies like national legal frameworks and strategies - should be geared towards making such partnerships feasible and desirable to operationalize.

Establish a coordinated project pipeline:
Together with having a better understanding of energy access in displacement settings through data and having access to different financing through the operationalization of innovative finance models, implementation of the SDG 7 agenda in these contexts should be supported by a coordinated way of developing high-quality, sustainable and bankable projects around household cooking, household electrification, and decarbonizing of energy infrastructure together with local and national partners. Policies that set commitments to climate mitigation and energy transition in displacement settings are the prerequisite of such large-scale implementation.

POLICIES FOR INCREASED ENERGY ACCESS IN DISPLACEMENT SETTINGS

Humanitarian organizations are increasingly incorporating sustainable energy practices into programming. Examples include capitalizing on locally available energy markets to provide Rohingya refugees in Bangladesh with access to clean cooking in the form of liquefied petroleum gas[1], solar powered water pumping systems in Bangladesh[2], South Sudan[3] and Nigeria[4], to the supply of large-scale renewable energy facilities through private sector contracts[5] or private sector donations.[6]

Two trends are emerging that should enable increased and comprehensive delivery of sustainable energy solutions in displacement situations. First, there is widespread recognition that humanitarian relief must be aligned with development objectives as soon as it is feasible in order to deliver sustainable solutions for displaced populations and their hosts. This encourages longer term planning which in turn opens the way for the inclusion of more sustainable energy solutions in the response for displaced populations. Second, there is a shift in thinking regarding responsibilities for delivering the benefits of sustainable development for all, including energy to displaced people, that seeks to harness market-based models and partnerships with the private sector.

These two trends are reflected in a series of recent international policy frameworks that aim to create and enable national level policy environments for increased delivery of sustainable energy solutions in situations of displacement. The policy frameworks do not yet give much detailed guidance on which policy mix is best suited for the vast array of displacement contexts, yet recent examples offer evidence for ways in which policy might yet develop to encourage the mainstreaming of sustainable energy solutions in displacement settings.

A NEW WAY OF WORKING[7]

The period of 2015 - 2018 represents a turning point in the global policy landscape, with United Nations Member States committing to new development and humanitarian agendas that aim to continue driving transformational change beyond the Millennium Development Goals. These international policy developments, and their inter-connected nature, offer a global framework conducive to national and local level action to address multi-sectoral issues, including access to sustainable energy for those living in displacement settings.

The 2030 Agenda for Sustainable Development pro-

1 Rohingya refugee camps turn to LPG, reforestation to save depleted Bangladesh forests. IOM UN Migration https://www.iom.int/news/rohingya-refugee-camps-turn-lpg-reforestation-savedepleted-bangladesh-forests (2019).

2 International Organization for Migration. IOM, Japan build solarpowered water supply network for 30,000 Rohingyas. Reliefweb https://reliefweb.int/report/bangladesh/iom-japan-build-solarpowered-water-supply-network-30000-rohingyas (2019)

3 As the sun rises, the water flows: a green humanitarian response in South Sudan. IOM UN Migration https://medium.com/@UNmigration/as-the-sunrises-the-water-flows-a-green-humanitarian-response-in-southsudan-2b629d2766dd (2019)

4 In North-East Nigeria, access to water paves the way for a brighter future. IOM UN Migration https://www.iom.int/news/north-eastnigeria-access-water-paves-way-brighter-future (2019). Shining a light on sustainable power: how clean energy is helping to improve camps for displaced people. UN News https://news.un.org/en/story/2019/06/1040511 (2019).

5 Scatec Solar secures first combined solar and battery project with IOM – UN Migration. Scatec Solar https://scatecsolar.com/2019/05/07/scatec-solar-secures-first-combined-solar-and-battery-project-with-iom-un-migration/ (2019).

6 Renewable energy boost for Azraq refugee camp. Ikea Foundation https://ikeafoundation.org/story/renewable-energy-boost-forazraq-refugee-camp/ (2018).

7 Mach, E. (2019), 'The Migration-Energy Nexus in International Policy' in Grafham, O. (ed), Energy Access and Forced Migration, Routledge, UK.

vides the overarching framework for this post-2015 development agenda, comprising 17 Sustainable Development Goals (SDGs). The inclusion of a standalone sustainable energy goal (SDG 7) that has strong connections to almost all other Goals[8], a separate target on migration (SDG 10.7) supported by an array of migration-related targets (for example, SDGs 8.8, 10.c., 16.2 and 17.3), including those aiming to reduce drivers of displacement (for example, SDG 11.5 and SDG 13.1), provides the context to consider displacement and energy across different development and humanitarian areas. The SDGs and their financing framework, the Addis Ababa Action Agenda, also recognize the quintessential role of multi-stakeholder partnerships (SDG 17) to implement the 2030 Agenda, including those with the private sector. Aimed at delivering a better and more sustainable future for all, SDG 17 also includes important targets to enhance policy coherence for sustainable development (SDG 17.14), to enhance availability of reliable data (SDG 17.18), and to encourage effective partnerships (SDG 17.17).

In line with the SDGs, the New Way of Working (NWOW) launched at the World Humanitarian Summit in 2016 urges humanitarian and development actors to work together to reduce humanitarian needs, mitigate risks and reduce vulnerabilities. As a way to respond to the mounting humanitarian challenges worldwide, the NWOW encourages longer-term planning, underscoring the importance of reinforcing local systems and the shift from funding to more predictable financing. Both are prerequisites for sustainable energy matters and market-based energy solutions to be considered systematically in humanitarian aid beyond addressing the basic needs of affected populations such as food, water, shelter and medical assistance. Guided by the SDGs and the NWOW, energy programming represents a critical area of the humanitarian-development nexus, especially in protracted displacement situations which may be excluded from traditional development plans and activities.

In parallel to the SDGs and the NWOW, the New York Declaration for Refugees and Migrants adopted later in 2016 demonstrated the political will of UN Member States to collectively address migration. Two processes were initiated by the New York Declaration to establish an international governance framework: the Global Compact for Safe, Orderly and Regular Migration (GCM) for governing international migration; and the Global Compact on Refugees (GCR) for governing refugee issues.

The New York Declaration underlined the commitment to tackle environmental impacts and infrastructural challenges linked to large population movements as part of international collaboration. In line with that and the lessons drawn from the application of the Comprehensive Refugee Response Framework, the GCR explicitly incorporates energy considerations as a way to address environmental impacts of large population movements, address the energy needs of refugees through safe access to fuel and energy programming, and maximize private sector contributions for the development of innovative technology, including renewable energy.[9] The GCM does not make any direct reference to energy, but there are several ways energy could play a role in supporting its implementation including by enabling access to basic services for migrants and potentially addressing the adverse drivers of migration through contributing to economic development and basic infrastructure providing key services[10]. While displacement within countries - with some 41.3 million currently counted as internally displaced people[11] - falls outside of the scope of these global frameworks, the energy-related commitments of these frameworks could benefit these populations as well.

Taken all together, these global frameworks offer guidance on advancing the role of sustainable energy in displacement settings in national and local policies, embracing a multi-stakeholder, longer-term approach with the overall objective to extend the benefits of accessing sustainable energy to displaced people in line with the global vision of Agenda 2030 to 'leave no one behind'.

8 Fuso Nerini, F., Tomei, J., To, L.S. et al. Mapping synergies and trade-offs between energy and the Sustainable Development Goals. Nat Energy 3, 10–15 (2018).

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10 Mach, E. (2019), 'The Migration-Energy Nexus in International Policy' in Grafham, O. (ed), Energy Access and Forced Migration, Routledge, UK.

11 Internal Displacement. IDMC http://www.internal-displacement.org/internal-displacement (2019).

EMERGING NATIONAL MODELS

The New York Declaration and the GCR and GCM seek for humanitarian and development actors to work better together and to bridge the humanitarian-development divide. One way to achieve this is through national coordinated responses. For example, the Jordan Response Platform for the Syria Crisis and the Kalobeyei Integrated Socio Economic Development Plan in Kenya, outlined below, illustrate the potential for sustainable energy solutions when displaced populations are included in national and/or sub-national development planning.

The Hashemite Kingdom of Jordan pioneered a national coordination model when it became clear that the safe return of the Syrian refugee population hosted since 2011 would not be possible in the near term. In 2014, the Government of Jordan combined the existing refugee response with the national development plan under one national planning and coordination framework known as the Jordan Response Platform for the Syria Crisis (JRPSC)[12]. The Jordan Response Plans (JRPs) that are agreed upon in the JRPSC address the needs and vulnerabilities of the Syrian refugee population along with the needs of the Jordanian host population, communities and institutions affected by the crisis. The main implementing agencies of the JRPs are not only humanitarian agencies: development agencies such as UNDP and UNESCO are also included. Energy, not having been included in the initial humanitarian response to the Syrian refugee influx, is one of the sectoral priorities under the JRPs, with defined areas of need and requested budget for implementation. The JRPSC and resulting JRPs illustrate that when humanitarian response is aligned with development objectives, the energy needs of displaced people and host communities can be accounted for in a comprehensive approach.

Another example of humanitarian response being combined with development programming is the Kalobeyei Integrated Socio Economic Development Plan (KISEDP) (2018) from Kenya. Similar to the JRPs, the KISEDP seeks to address the socio-economic impact of the presence of refugees on the host community and was developed in close cooperation between United Nations High Commissioner for Refugees (UNHCR), the county and central government, together with humanitarian and development partners. In the Kalobeyei Integrated Settlement, located next to Kakuma refugee camp (established in 1992), refugees live together with the host population so that services can be delivered to both populations. The KISEDP provides a 5-year time horizon, from 2018-2022, and is an integral part of the county development plan.[13] The KISEDP includes sustainable energy solutions as a separate component in its plan, given that 95% of the host and refugee population of the settlement do not have access to clean and affordable electricity and 90% do not use clean cooking technologies.[14]

These examples from Jordan and Kenya pre-date the GCR and the GCM, and show some of the thinking that was already evolving in the humanitarian and development fields. This suggests that the GCR and GCM are codifying an approach that was already being taken in some countries, while encouraging its spread to others. It should be noted that these two cases are addressed by stable host governments faced with protracted situations of displacement. In the case of fragile or emergency contexts, governments may not be able to take the lead in setting up national coordination models and/or address protracted humanitarian needs in development planning from the onset. Such contexts would require humanitarian and development actors to be linked from as early as possible to ensure both immediate and longer-term needs are met.

12 The Jordan Response Plan for the Syria Crisis 2017 – 2019 http://www.jrpsc.org/publications (2019).

13 KISEDP Strategic Overview p1 (KISEDP, 2018); https://www.unhcr.org/ke/wp-content/uploads/sites/2/2019/04/201904_KISEDP-STRATEGIC-OVERVIEW.pdf

14 KISEDP Strategic Overview p21 (KISEDP, 2018); https://www.unhcr.org/ke/wp-content/uploads/sites/2/2019/04/201904_KISEDP-STRATEGIC-OVERVIEW.pdf

PRIVATE SECTOR ENGAGEMENT

Alongside bringing humanitarian and development sectors closer together, the World Humanitarian Summit also discussed the need for partnerships with the private sector in the context of insufficient public funds for the growing humanitarian crisis and acknowledgement that agencies and NGOs could not do everything alone. While the importance of private sector engagement for both technical expertise and solutions and financing has been recognized in all relevant international frameworks, there is little to no guidance on how to effectively operationalize such engagements between humanitarian organisations, development actors, host governments, and the private sector. For private sector actors, the increased number of stakeholders in humanitarian settings can be daunting and time-consuming to understand. Streamlining and centralising coordination as exemplified by the JRSPC and the KISEDP may be a way to clarify roles and responsibility amongst actors and set clear policy environments for private sector engagement.

Historically, humanitarian response has had a planning and budgetary time horizon of 1 year maximum, enforcing the temporality of humanitarian response. This has made it difficult for the private sector to implement sustainable energy solutions as the investment required usually results in a payback period of a few years. By including (protracted) displaced populations in national development planning, the time horizons for planning and budgeting are extended to 3 or 5 years, partially de-risking private sector investments.

In Jordan, the IKEA Foundation funded the world's first solar farm for a refugee camp in Azraq[15], supporting the provision of electricity to 20,000 refugees. Importantly, the project was designed to connect to the national grid, ensuring that the infrastructure continues to provide electricity nationally when the refugee camp closes. The Azraq solar farm is an example whereby the energy needs of both the displaced and host population were taken into consideration in both the short term and long term, showing that the results of the national coordination combining humanitarian response with national development goals allowed for private sector engagement.

Engagement of the private energy sector in protracted displacement situations is still in its nascency. It should also be noted that the role of the private sector in emergency and fragile situations has received far less consideration given the heightened complexity and risks involved.

THE PATH FORWARD

The examples discussed above offer no one-size fits all policy solutions on how to integrate energy programming in the wide range of displacement settings that exist. Nevertheless, they provide valuable lessons for policymaking for sustainable energy solutions in protracted, large-scale displacement situations, particularly where infrastructure capacity and/or natural resources of host countries are impacted. The principles underpinning the NWOW – bridging the humanitarian-development divide and having a combined response – are starting to be put into practice and yielding results for increased sustainable energy services being provided for both displaced and host communities.

There are myriad displacement contexts around the world, ranging from refugee and internally displaced people camp settings to urban displacement, from host communities in fragile and conflict affected states to host communities in developed countries,

15 UNHCR, IKEA Foundation. Azraq, the world's first refugee camp powered by renewable energy. UNHCR USA https://www.unhcr.org/en-us/news/press/2017/5/591c079e4/azraq-worlds-first-refugee-camp-powered-renewable-energy.html (2017).

each of which require a different combination of energy services and solutions to meet needs. A primary objective going forward should be the identification of two critical factors: the appropriate mix of policies needed to achieve the vision of SDG 7 in-country both at national and local government levels; and the institutions key to implementing them, including humanitarian and development agencies and national centres of expertise, as well as traditional international aid donors and private sector actors.

Achieving this requires a greater evidence base on access to sustainable energy across the array of displacement settings, including fragile contexts and urban settings, as well as mature and developing energy markets. Research is thus needed to take stock of available practices and understand their policy implications. At the same time, there is a need to better understand the most appropriate and feasible timing of energy interventions in different contexts, and to then identify the policy enablers and bottlenecks. In particular, it's important to examine how humanitarian operations can provide a good basis for energy programming in the future and how development and private sector expertise can be pulled into displacement settings as soon as possible, as well as how coordination and handover from one set of partners to another can be done more successfully, leveraging the strengths of each partner.

Finally, it's increasingly important to identify how host governments can be better supported through the international agenda and what type of policies need to be in place to make the energy transition happen in displacement settings. This will require analysis in how international or national energy policies apply in displacement settings and how displaced populations can be included in these energy policies. There is also learning required around how existing solutions can be scaled-up and better incorporated into both humanitarian and development planning.

The past few years have shown a significant change in approach to the role of sustainable energy in displacement settings and the recognition of the private sector as a key partner for enabling sustainable development. This trend now needs to be crystalised into clear and coherent national policies that will ensure sustained ¬and sustainable energy access for displaced populations through increasingly leveraging private sector engagement.

WORKING TOGETHER IN AND BEYOND 2020[16]

To holistically address the challenges around energy in displacement settings, the Global Plan of Action for Sustainable Energy in Situations of Displacement (GPA) was established in 2018, following extensive consultations among various stakeholders from humanitarian and development organizations, private sector, governments, academia and not-for-profit organizations.[17] The GPA is a non-binding framework that provides a collaborative agenda for concrete actions to ensure that all displaced people and displacement affected communities enjoy safe access to affordable, reliable, sustainable, and modern energy services by 2030. The GPA Coordination Unit, tasked to galvanize collective action, is hosted by the United Nations Institute for Training and Research (UNITAR) and the initiative is steered by representatives from the following organisations: UNHCR, the International Organization for Migration (IOM), GIZ, World Food Programme (WFP), the Food and Agriculture Organization of the United Nations (FAO), Chatham House, Practical Action, UNEP-DTU, the United Nations Development Programme (UNDP), the Clean Cooking Alliance, MercyCorps and Sustainable Energy for All.[18]

16 This part was written by Eva Mach (International Organization for Migration) and Thomas Fohgrub (GPA Coordination Unit at United Nations Institute for Training and Research) as a complementary analysis to the Policies for increased sustainable energy access in displacement settings paper first published in Nature Energy in 2019. The opinions expressed in this publication are those of the authors and do not reflect the views of the United Nations Institute for Training and Resarch (UNITAR), the International Organisation for Migration (IOM), or any other UN body. The designation employed and the presentation of the material in this publication do not imply the expression of any opinion on the part of UNITAR or IOM concerning the legal status of a country, city or area or its authorities or concerning the delimitation of its frontiers or boundaries.

17 What is the Global Plan of Action for Sustainable Energy in Displacement Settings?. UNITAR https://www.humanitarianenergy.org/what-is-the-gpa (2019).

18 Who is involved in the Global Plan of Action for Sustainable

Building on the inter-agency and inter-sectoral momentum encouraged through the GPA, there has been an increased awareness of the enabling role energy plays in the quality of life of crisis-affected communities. Humanitarian agencies have started to translate such awareness into concrete steps including designing their own internal energy strategies and mainstreaming energy in current frameworks and discussions. For example, the International Committee of the Red Cross (ICRC)[19] and UNHCR have developed their own multi-year institutional energy strategies while UNICEF, IOM and NRC have been integrating energy considerations in their environmental sustainability frameworks.

Based on the UNHCR 2019-2024 Global Strategy for Sustainable Energy[20], the United Nations High Commissioner for Refugees issued an ambitious Clean Energy Challenge[21] at the 2019 Global Refugee Forum. The Challenge was co-designed by the World Economic Forum and the GPA partnership and is supported by more than 40 partners (governments, United Nations agencies, academic, private sector, NGOs alike). It aims to boost action to provide access to affordable, reliable, sustainable and modern energy by 2030 in refugee settlements and nearby host communinties, which is in line with the overarching goal of the GPA framework.[22] The GPA Coordination Unit serves as the secretariat for the Challenge to ensure coordination and maximize synergies between the initiatives.

In 2020, the GPA community aims to build the foundation for large-scale energy transition from 2021 onwards oriented under three pillars in line with the previously proposed actions:

1. Increase data availability and harness better data[23]:

Research and data collection are key to develop a baseline for energy access globally as well as to translate the data collected into useful information, aiding the design of energy access projects with evidence. Including displacement considerations in current energy policies and frameworks is needed to allow and drive effective data collection in line with a harmonized national and/or global framework. Policies that encourage fit-for-purpose data base building and evidence-based interventions are key to advance the GPA agenda at a larger-scale.

2. Operationalize innovative finance:

Mapping and developing alternative finance models besides traditional grant funding is vital to turn the vision of SDG 7 in displacement settings into reality. Recognizing that energy is one of the few areas in humanitarian response that represent viable business opportunities for private sector actors to engage in, policy discussions – both internal policies of stakeholders and external policies like national legal frameworks and strategies - should be geared towards making such partnerships feasible and desirable to operationalize.

3. Establish a coordinated project pipeline:

Together with having a better understanding of energy access in displacement settings through data and having access to different financing through the operationalization of innovative finance models, implementation of the SDG 7 agenda in these contexts should be supported by a coordinated way of developing high-quality, sustainable and bankable projects around household cooking, household electrification, and decarbonizing of energy infrastructure together with local and national partners. Policies that set commitments to climate mitigation and energy transition in displacement settings are the prerequisite of such large-scale implementation.

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19 How the ICRC is learning to use energy more sustainably for itself, for the people it serves and for the planet. ICRC https://blogs.icrc.org/inspired/2019/07/19/new-energy-future/ (2019).

20 Global Strategy for Sustainable Energy. UNHCR https://www.unhcr.org/5db16a4a4.pdf (2019).

21 Clean Energy Challenge. UNHCR https://www.unhcr.org/clean-energy-challenge.html (2019).

22 Global Plan of Action for Sustainable Energy in Displacement Settings Framework. UNITAR https://unitar.org/sites/default/files/media/file/gpa_framework_final-compressed.pdf (2018).

23 Grafham, O., Sandwell, P. Harness better data to improve provision of humanitarian energy. Nat Energy 4, 993–996 (2019).

POLICY BRIEF

BUILDING GLOBAL ENERGY INTERCONNECTION AND STRENGTHENING INTERLINKAGES WITH THE SDGs

Contributing organizations:

Global Energy Interconnection Development and Cooperation Organization (GEIDCO)

KEY MESSAGES

GEI (Global Energy Interconnection) is a framework for power sector decarbonisation that utilizes large-scale grid connectivity to support affordable integration of high shares of clean energy resources. Its aims are to optimise the use of regional generating resources, integrate more variable renewable energy into the grid, and improve social equity through improved reliability and affordability of electricity. Doing this can also support other sustainable development goals by reducing the costs of decarbonisation and enabling greater use of clean energy nationally, regionally, and globally.

Under a GEI scenario, as modelled by GEIDCO, by 2050 the global clean energy installed capacity (with clean energy optimised) would reach 84%, and inter-continental and inter-regional power exchange (i.e. transmission) capacity would reach 660 GW. The average power generation cost is estimated to be about 40% lower than the current one. More than 300 million new jobs would be created globally, making a positive contribution to poverty eradication.

Energy interconnection is progressing in many parts of the world, largely motivated by the potential benefits of enhanced energy security, access to lower-price renewable energy from afar, and economic gains from power trading. A number of interconnection projects are being planned, developed and constructed at various voltage levels. Many of the building blocks of GEI are in place as the result of these ongoing regional integration efforts.

Advancing GEI is facing major challenges, however, related to lack of political trust, investment motivation, and transnational coordination mechanisms. Therefore, it is highly recommended to establish work mechanisms at the UN level to support regional power system integration and GEI development, mobilise all countries to include regional grid development as a vital component of green stimulus plans, and help to establish regional cooperation centres to support R&D and implementation of GEI plans.

BUILDING GLOBAL ENERGY INTERCONNECTION AND STRENGTHENING INTERLINKAGES WITH THE SDGS

Key Concept

GEI is designed as an implementable, scalable, and replicable system for the optimal allocation of clean energy through global grid interconnections that link up countries with different resources, time zones, seasons, and electricity prices. GEI is meant to coordinate renewable resource deployment across borders, accommodating both transmission and distribution through grid development. Associated power markets can support energy trade.

The three pillars of GEI are: smart grid technologies; ultra high voltage (UHV) transmission; and clean energy.

Smart grid technologies allow for a high degree of flexibility and adaptability, integrating various centralised and distributed energy sources and providing smart interactive services.

The UHV grid system, composed of ±1000kV AC power transmission, and ±800kV and ±1100kV DC power transmission, enables power transmission over long distances with large capacity, high efficiency, low losses and high security.

GEIDCO has studied and proposed large-scale construction plans for GEI, covering clean energy exploitation, electricity access, power infrastructure upgrading, grid connectivity and power price analysis.

As an alternative to maintaining the current energy development path, GEI could be combined with other enabling policies (like increased electrification) to enable a quadrupling of global clean energy development, and quintupling of the average annual increase rate of clean energy consumption. With the development of GEI, by 2050 clean energy installed capacity could reach 84%, with electricity representing over 44% of final energy, and the proportion of fossil energy in final energy reduced to below 31% (GEIDCO, 2018).

GEIDCO has been conducting analysis and study of the relationships between GEI and the SDGs, which shows that GEI can aid in the comprehensive implementation of SDG 7, thus synergising and strengthening interlinkages with other SDGs.

Energy Interconnections: Current Status

Cross-border and regional electricity interconnections have been expanding around the globe for many years. Transnational power grid interconnection lines run nearly 10,000 km, with transfer capacity of about 250 GW (GEIDCO, 2017). Several regional interconnected power grids have been formed in Europe, North America, Latin America, Africa, and Asia with ultra/extra high voltage AC/DC transmission system of 330 kV and above, laying a solid foundation for well-functioning regional power trade. In recent years, cross-border grid interconnection has been gaining momentum against the backdrop of large-scale development of renewable energy in a bid to cut GHG emissions.

Northeast Asia

Over the past decades, the scale of interconnection in Chinese power grids has increased substantially, accompanied by a constant increase in voltage levels. Currently, there are six synchronous grids in mainland China, which are fully interconnected, with over 20 UHV DC/AC lines. In order to boost transmission of renewable power from north to south and from west to east, several more UHV DC/AC projects are at different stages of development.

GEIDCO, the State Grid Corporation of China (SGCC) and the Korean Electricity and Power Corporation (KEPCO), are leading a pre-feasibility study for a China-South Korea power grid interconnection project. The transmission capacity would be 2.4 GW, with a transmission cost of about 2 cents / kWh. The electricity price would be about 7 cents / kWh, which is very competitive compared with the average wholesale price in South Korea. This project would be part of the Belt and Road energy cooperation, and of great value for clean transition in the northwest section of South Korea (GEIDCO, SGCC, KEPCO, 2018).

Southeast Asia

The grids of countries in the region have already been interconnected by a dozen extra high voltage AC and DC links. According to the power grid development plan proposed for the Association of Southeast Asian Nations (ASEAN) by the Heads of ASEAN Power Utilities/Authorities (HAPUA), 16 AC and DC projects are expected to be built by 2025 to enhance grid interconnections among ASEAN countries.

GEIDCO, together with the ASEAN Center for Energy and UN ESCAP, had done a joint study which was aimed to presents technically feasible pathways for energy interconnectivity that will help to achieve higher penetration of clean energy in ASEAN. In addition, it aimed to quantify the primary benefits of these pathways for sustainable development. The study reviewed different regional initiatives to advance regional power integration, including: a China-Myanmar-Bangladesh interconnection with transmission capacity of 4 GW; a China-Vietnam interconnection Project with transmission capacity of 4 GW; and a Kalimantan-Java Island (Indonesia) submarine cable interconnection with transmission capacity of 3 GW.

Europe

Interconnectors between European countries have created five synchronous regions covering 36 countries. Grid interconnection and electricity market integration have enabled a high level of power exchange among the member states. Current interconnector capacity amounts to 11% of installed generation capacity across European countries. In 2018, a total of 440 TWh was exchanged, representing 12% of total power consumption. In 2017, the European Council adopted a 15% goal for electricity interconnection between member states in the EU. Every two years the European Networks of Transmission System Operators for electricity (ENTSO-E) identify key cross-border transmission projects as Projects of Common Interest (PCIs), which will be given priority in approval and financing processes.

According to GEIDCO's analysis, power flow in Europe would have a pattern of intra-continental power transmission from north to south, and imported power from Asia and Africa. A fully integrated, high-voltage European power grid would connect wind power bases in the North Sea, Baltic Sea, Norwegian Sea and Barents Sea, hydropower bases in Northern Europe, and solar energy bases in North Africa, West Asia and Central Asia. Inter-continental and inter-regional power exchange in Europe would reach 133 GW by 2050.

Africa

The African continent is split into five different power pools, at different stages of development, with very little interconnection capacity between them. Power pools essentially serve as platforms for regional electricity infrastructure planning and development. Despite sustained integration efforts, and growth in generation and transmission capacity within each power pool since 2010, the degrees of infrastructure and market integration effectively achieved vary widely between pools. Further developments in intra-pool and inter-pool interconnection capacity are envisaged and supported by the Programme for Infrastructure Development in Africa (PIDA). In 2018, USAID rolled out a Power Africa Transmission Roadmap to 2030.

Also in 2018, the Government of the Republic of Guinea and GEIDCO jointly launched an initiative to establish the Africa Energy Interconnection and Sustainable Development Alliance (AEISDA). Supported by 20 African countries and more than 80 public-private sector players, the alliance is promoting clean development and cross-border power grid interconnection projects in Africa.

North America

Five synchronous power grids are operating in North America, including: the eastern North America power grid; the western North America power grid; the Texas power grid in the United States; the Quebec power grid in Canada; and the Mexico power grid.. With more than 800 GW of installed capacity, the eastern North America grid is the largest synchronous grid in the world. Within the synchronous areas, substantial interconnection capacity is already in operation across the US-Canada border, enabling a tight coupling between electricity systems and power markets of the two countries. This results in enhanced electric reliability and security, as well as increased economic benefits. Still, there is a need to strengthen and better integrate electricity grids both on a regional and a national scale, in order to shore up power system resiliency, robustness and sustainability.

A GEIDCO study proposes that, by 2050, North America could build one inter-continental, seven cross-border, and 18 regional interconnection projects to support clean energy transmission and use. Power flow in North America would reach 200 GW, achieving mutual support between eastern and western power grids in North America, as well as between North America and Central and South America. The scale of cross-border power transmission capacity would reach 66 GW, and the power transmission capacity across the North America continent would be 10 GW

Latin America

A Central American Electrical Interconnection System (SIEPAC) project is linking several Central American countries and further integrating their electricity systems. The first interconnection was completed in 2014, and funding for a second line was secured from the Inter-American Investment Corporation in late 2018.

In South America, the existing, under construction, or planned grid interconnections are mainly concentrated in two geographical areas. The northern section includes Colombia, Ecuador and Venezuela, and the southern section covers Argentina, Brazil, Paraguay, and Uruguay. A large programme to integrate the electric systems of five Andean Community nations is being pursued.

According to GEIDCO's analysis, the power flow in Central and South America would feature hydropower transmission from north to south, wind power transmission from south to north, solar power transmission from west to east, and inter-continental mutual power support between South America and North America. The cross-border, inter-regional and inter-continental power transmission capacity could reach 91 GW by 2050.

Benefits of GEI

Facilitating the overall development and global allocation of energy resources through infrastructure connectivity to secure energy supply

Clean energy resources are widely distributed on all continents, though often in places far from load centres. GEI takes ecological goals and the scientific development of global clean energy bases into consideration, to help increase energy supply flexibility and diversity, and improve energy efficiency and security. Under a GEI scenario, the proportion of clean energy capacity installed globally would reach 73% and 84% in 2035 and 2050 respectively. The proportion of clean energy power generation would increase to 65% in 2035 and 81% in 2050. Clean energy would be optimised globally to form a multi-energy source and cross-time-zone complementary pattern. The inter-continental and cross-region power exchange capacity would reach 660 GW (GEIDCO, 2019).

Achieving clean electricity interconnections to advance regional economic and social development

GEI would help transform the resource advantages of under-developed areas into economic ones. It can advance sustainable economic growth, increase the level of R&D and capacity-building, and improve employment opportunities as well as the labour participation rate of women.

For example, a Kenya-Ethiopia electricity highway, with transmission capacity up to 2,000 MW, would enable the development of Ethiopia's large hydropower resources for export and to address power shortages in East African countries. In Kenya alone, the additional power injected into the national grid would enable the supply of electricity to 1.4 million additional households by 2022, of which 18% would be located in rural areas. Businesses and industries would also benefit from around 5,100 GWh of additional energy by 2022. This project could generate more than 4,000 jobs in countries crossed by the electricity highway, with new employment related to construction, operation and maintenance (AfDB, 2012).

With large-scale development of clean energy, innovation in investment and financing models, plus natural resource endowment and labour advantages, the GEI model for co-development of electricity, mining, metallurgy, manufacturing and trade could be implemented to foster new growth points in some LDCs.

Guinea, for example, has an annual production capacity of 6 million tons of electrolytic aluminum, and resource capacity of 40 million tons of iron and steel. The power demand of these industries exceeds 100 TWh. Domestic hydropower capacity is unable to

support the processing industry, and thus the country can only export raw minerals. The economic value would increase over seven fold if there were sufficient power for local metallurgy and manufacturing (GEIDCO, 2019b). The power flow needed for this increased industrial development could be provided through grid interconnection.

The total investment needed for building GEI is about US$ 34 trillion, including US$ 24 trillion for power generation, and US$ 10 trillion for investment on power grid connectivity, with an average contribution rate of 2% to global economic growth. By 2050, the average power generation cost would be about 40% lower than currently. More than 300 million new jobs could be created globally (GEIDCO, 2019), contributing to eradication of poverty.

GEI can tackle climate change and environment sustainability

The shift to a low-carbon energy system can reduce air pollution, promote human health, and achieve coordinated environmental protection of climate, pollution, and health. Every 100 GWh of clean electricity transmitted by a UHV grid can reduce emissions by the equivalent of 7 tons of PM2.5, 17 tons of PM10, and 450 tons of sulfur dioxide and nitrogen oxide. Since 2010, the three UHV DC lines in China have transmitted more than 600 TWh of hydropower from Sichuan (in southwest China) to Shanghai, Jiangsu and Zhejiang (in east China). According to the calculation of 35000 tons of standard coal per 100 GWh, East China reduced the consumption of standard coal by 2.41 billion tons and CO2 emissions by 602 million tons, making positive contributions to clean development in China.

GEIDCO, together with the International Institute for Applied Systems Analysis (IIASA) and the World Meteorological Organization (WMO), conducted research on a climate change mitigation plan. The GEI 2oC and 1.5oC scenarios were quantified using a global Integrated Assessment Modelling (IAM) framework covering energy system optimisation and power system planning.

In the GEI 2oC scenario, the global CO2 emissions from energy systems would reach a peak in around 2025, and net zero in around 2065. The mitigation path would include three stages: emissions would decrease at a medium speed first; at a high speed during the middle period; and eventually at a slow speed after reaching net-zero. The cumulative CO2 emissions from energy systems would be about 1000 Gt CO2 in 2018-2100, providing a projected reduction in emissions of about 130 Gt CO2, and achieving the 2 oC goal with a probability of 67% or above.

If the speed and scale of clean development and grid interconnection could be accelerated, CO2 emissions from energy systems would reach a peak before 2025, and net zero by 2050. The cumulative CO2 emissions from energy systems in 2018-2100 would then be about 360 Gt CO2, providing a reduction in emissions of 150 Gt CO2, and thus achieving the 1.5 oC goal.

Compared with a business as usual (BAU) scenario[1], if achieved the GEI 2oC and 1.5oC scenarios could avoid global climate damage estimated at about US$ 20 trillion - 22 trillion from 2020 to 2050, equivalent to 0.4% of Gross World Product (GWP) during the same period, and avoid climate damage amounting to nearly 3% of global GWP from 2020 to 2100 (GEIDCO, IIASA, WMO, 2019).

Obstacles to Developing GEI

Lack of political trust among regions and countries

Due to geopolitical tensions and existing conflicts between countries and regions, global energy programmes may be controversial. The costs and benefits of restructuring energy systems may differ substantially for different countries, and for other relevant parties such as investors and operators. These concerns require in-depth discussions and joint consultation. Transnational power grids and power trading require a high degree of mutual trust between countries, and when the proportion of power trading increases, energy supply security becomes a primary consideration.

Gaps in mobilising financial resources for transnational power projects

1 Business as usual (BAU) is based on the existing national policy scenario of IIASA ("NPI scenario"). McCollum D L, Wilson C, Bevione M, et al., Interaction of Consumer Preferences and Climate Policies in the Global Transition to Low-carbon Vehicles, Nature Energy, 2018, 3(8): 664-673.

Large-scale energy and power infrastructure projects require huge capital investments, and long construction cycles. Issues related to political stability, economic volume, sovereign credit, tax policies, and legal protections are critical factors for project developers, and can negatively affect investment motivation.

The Grand Inga hydropower project provides an example. It is the largest hydropower project in the world and of great political significance, with an overall investment scale of US$ 80 billion. However, investors have been deterred by the volatile political status of the Democratic Republic of Congo, plus a project leadership dispute with the United States, and indifferent attitudes of the power transit countries such as South Africa and Nigeria.

In recent years, clean energy investments in most major economies have been around 1% of their GDP, far below the 2009 level. In addition to the high cost of clean power generation, the costs and requirements for supporting grids are demanding. Currently, the policies and subsidies of countries around the world are mainly focused on power generation, and the costs of supporting grids have not been addressed adequately.

Insufficient transnational coordination mechanisms in construction and operation

Power integration involves different power management systems, as well as public-private cooperation, which presents challenges. For example, Latin American countries in general have strong demand for energy integration, but only a few bilateral cooperative agreements. Central America, Andean countries and Southern Cone countries have differing demands, and there is a lack of comprehensive planning and synergy among all subregions and countries. Therefore, South America's energy integration is developing at a low speed, with few projects implemented.

Coordination between and within countries is not sufficiently supported by targeted policies and regulations, or by adequate mechanisms for information sharing, public consultation, in-depth interaction, or supervision and management. In particular, national and regional policies are needed to coordinate different parties in communicating and taking concerted actions towards interconnected grid planning, construction, and trade and technical standards, in order to build a project pool of transnational interconnection.

Policy Recommendations

The COVID-19 pandemic is currently spreading in an alarming way across the globe, and impacting overall world economic development. We foresee a slowdown in the renewable energy industry, even though the need for a global energy transformation remains unchanged. Governments are facing the difficult task of bringing the health emergency under control while introducing major stimulus and recovery measures. However, incorporating the advancement of clean energy development and infrastructure interconnection into these measures can help boost economic growth and improve human welfare, while also helping to meet the long-term objectives of the Paris Agreement and the SDGs.

Establish work mechanisms at the level of the United Nations to support GEI development. Developing GEI involves multiple levels of governance, and different countries and departments. A GEI working group involving UN entities could help develop global multilateral frameworks to facilitate global energy interconnections.

Mobilize nations to include regional grid development as a vital component of green stimulus plans within the overall economic recovery work. Coordinated planning mechanisms for clean energy exploitation and grid interconnections for energy system transformation can support short-term economy recovery, while in the long term achieving the intended NDCs on emission reductions and providing for more resilient and inclusive economic and social development in all countries.

Establish regional cooperation centres around the globe at the level of the United Nations to support R&D and implementation of GEI plans through technical assistance, market consulting, and fundraising. That can improve the synergy of cross-border joint operations, and the operational efficiency and security of power supply systems in different countries. Improved electricity access can further advance industrial development, an integrated electricity-carbon market, and various co-benefits to meet the SDGs.

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